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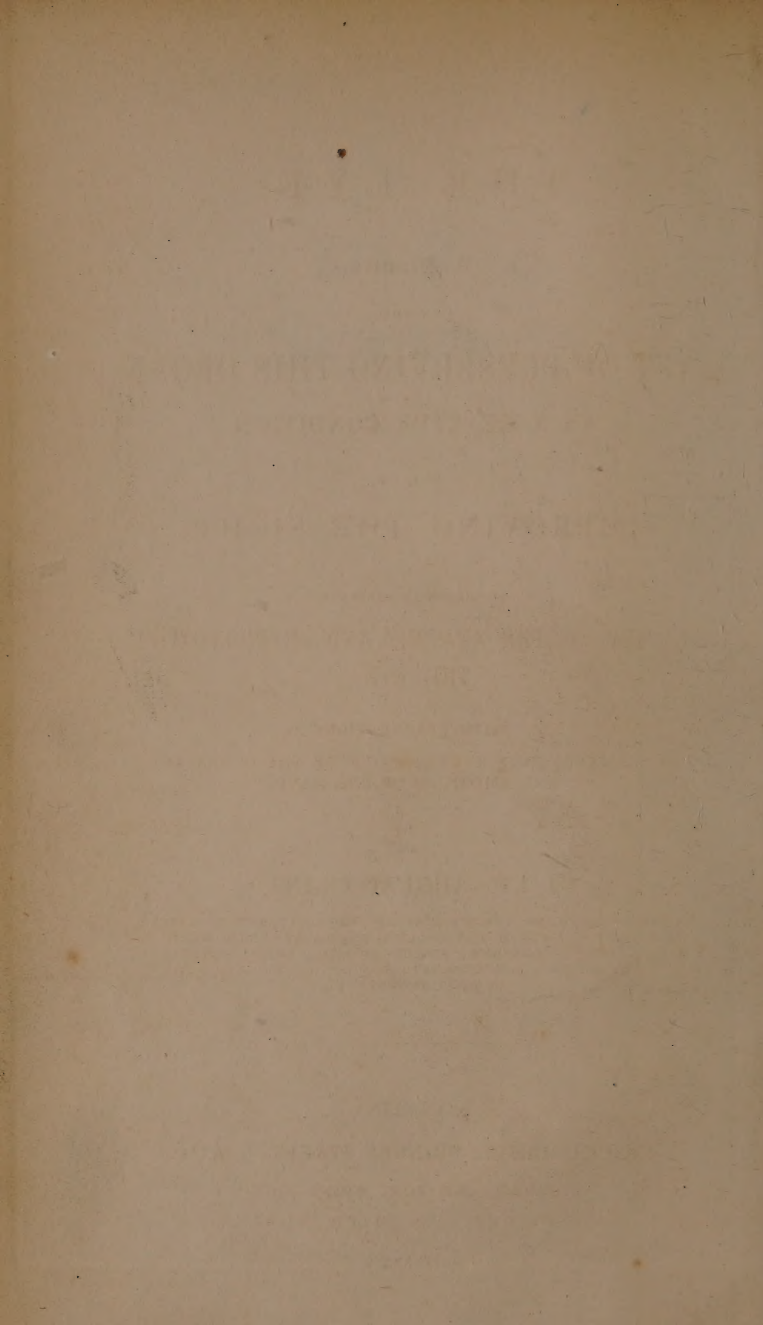
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A. C. Ponting



THE EYE:

A Treatise

ON THE

ART OF PRESERVING THIS ORGAN

IN A HEALTHY CONDITION,

AND OF

IMPROVING THE SIGHT;

TO WHICH IS PREFIXED,

A VIEW OF THE ANATOMY AND PHYSIOLOGY OF
THE EYE;

WITH OBSERVATIONS

ON ITS EXPRESSION AS INDICATIVE OF THE CHARACTER
AND EMOTIONS OF THE MIND.

BY

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LONDON:

J. CHURCHILL, PRINCES STREET, SOHO;

CARFRAE AND SON, EDINBURGH;

AND HODGES AND SMITH, DUBLIN.



PRINTED BY JOHN SCOTT,
62, John Street, Holland Street, Blackfriars Road.

TO

SIR BENJAMIN COLLINS BRODIE,

BART., F. R. S.,

*Sergeant-Surgeon to the Queen, Surgeon to St. George's
Hospital, &c. &c. &c.*

SIR,

THE motives which have influenced me in requesting permission to dedicate this Essay to you are—the respect due to your great talents and high scientific attainments, and a feeling of deep gratitude for the instruction and practical advantage I have derived from the perusal of your various writings.

To have favoured me with that permission, by which I am enabled to pay you this public tribute of respect and gratitude, is at once an evidence of a liberal and impartial spirit, a proof of genuine kindness of feeling, and an honour conferred upon the following pages which I can never too highly appreciate.

I have the honour to remain, with sentiments of profound esteem,

SIR,

Your most obliged
and obedient servant,

J. CH. A. FRANZ.

P R E F A C E.

IT is the duty of the medical man to labour not only for the cure, but also for the prevention of disease, and to use his best efforts for the preservation and improvement of the health of his fellow-men. With a view to the fulfilment of this duty, as regards a most important organ in the human frame—namely, that of sight, the master-work of creation,—I have entered upon the composition of the following Treatise, my chief object having been to point out the principles by which the organ of sight is preserved in a sound and healthy condition.

In accordance with this object, commencing with the age of childhood, and proceeding through the successive periods of life, I have considered the circumstances peculiar to each period, and called attention to whatever is calculated to prove either beneficial or injurious to the eye. I have moreover given instructions as to the steps that should be taken in the incipient stage of diseases of that

organ ; but I have forborne to introduce into these pages any prescriptions for ophthalmic medicines, being of opinion that medicinal remedies in the hands of persons unacquainted with the principles of medicine may be compared to knives in the hands of children.

In order to be better understood on the various points which the subject under consideration embraces, and to give some idea of the wonderful structure of the eye, I thought it necessary to furnish at the same time an outline of the anatomy and physiology of this organ. While occupied with this purpose, many other ideas suggested themselves to my mind, which,—under an impression that they might afford a proof of the dignity and importance of the organ of sight, and of its power of indicating the character and emotions of the mind,—I have presented to the reader, in the third and fourth Chapters of the first part of this volume ; for these two Chapters therefore I must apologise, as not strictly belonging to the subject in hand. Thus it has happened, that the observations which I at first wished to prefix merely as an introduction to the principal object, have increased under the pen so much beyond

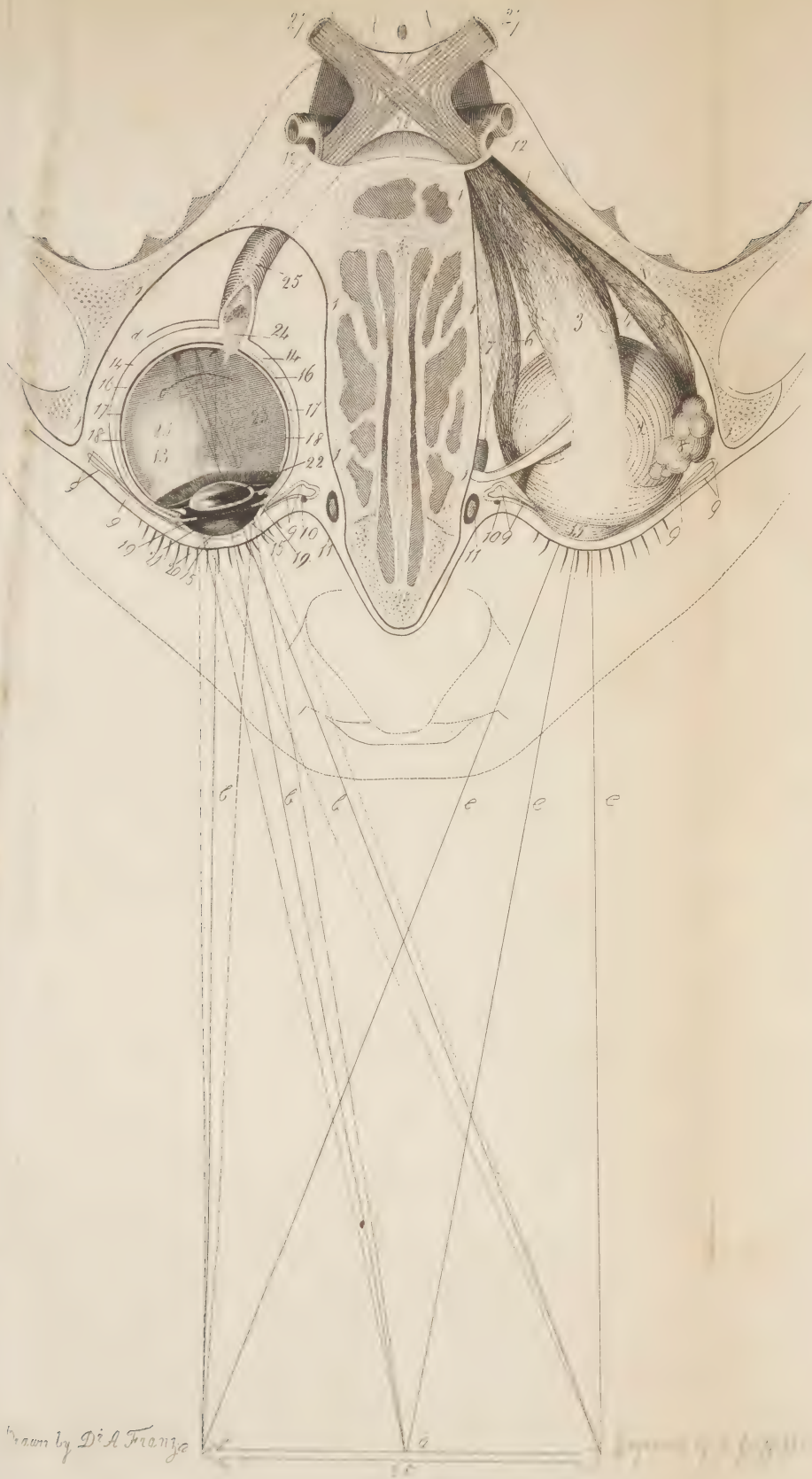
my original intention as to form a considerable portion of the present work.

The nature of my design in the composition of this Treatise has made it incumbent upon me to confine myself to general views without entering into minute details, in order that I may be understood by readers not of the medical profession; and I ought perhaps to add, that for the same reason I have been compelled to pass over one or two specific affections of the eyes wholly without notice. While I beg that this may be kept in mind,—well knowing how much I venture in sending into the world an essay in a language not my own, I solicit the indulgence of the public towards the work which I now submit to their judgment.

THE AUTHOR.

19, GOLDEN SQUARE,

October 28, 1839.



Drawn by D. A. Franke

Engraved by J. G. B. M.

EXPLANATION OF THE PLATE.

THE figure represents a horizontal section of the anterior part of the head, made in the direction of a line passing through the middle of the anterior aperture of each orbit, so as to show the form of the orbit; the position of the eyeball; the arrangement of its muscles; the lacrymal organs; the interior structure of the globe; the course of the optic nerve; and lastly, the formation of the image of an external object on the nervous membrane of the eye by means of the rays of light. In order to show the most important parts of the eye more distinctly, the vessels and nerves have been omitted in this figure.

1. The lateral walls of the orbit: the superior wall of the left orbit is entirely removed, but a portion of this wall is left towards the posterior part of the right orbit. (See page 3.)

2. The left eyeball with five of its muscles; the sixth, being situated at the inferior wall of the orbit, is hidden by the globe.

3. The superior straight muscle.	}	(See page 11.)
4. The inferior — —		
5. The exterior — —		
6. The interior — —		

7. The superior oblique muscle, with its tendon passing through a loop of cartilage, which is affixed to the foremost part of the upper wall of the orbit, where this wall unites with the interior wall. (See page 11.)

8. The lacrymal gland. (See page 12.)

9. The conjunctiva, covering a portion of the anterior hemisphere of the globe, and also the interior surface of the eyelids. (See page 5.)

10. Small orifices (*puncta lacrymalia*) through which the tears pass into the lacrymal ducts. (See page 5.)

11. A transverse section of the lacrymal ducts. (See page 5.)

12. The ophthalmic artery, as it enters the orbit by the foramen opticum.

13. A horizontal section of the right globe.

14. The sclerotica. (See page 6.)

15. The cornea. (See page 6.)

16. The choroid. (See page 8.)

17. The dark pigment. (See page 9.)

18. The retina. (See page 8.)

19. The iris, having the pupil widely open. (See page 6.)

20. & 21. The anterior and posterior chambers, containing the aqueous humour. (See page 7.)

22. The lenticular system. (See page 7.)

23. The vitreous body. (See page 8.)

24. The central artery. (See page 11.)

25. The optic nerve, enveloped in its sheath. (See page 9.)

26. The chiasma of the optic nerves, a longitudinal section of which is made, to show the numerous fibrils

composing these nerves, their course, and decussation. (See page 10.)

27. The part of the optic nerves coming from the brain. (See page 10.)

28. An object which reflects the light in the direction of the lines drawn from the points *a* to the eyes directed towards the object, just as every other point in the object would do. The lines *b* are pencils of light, as they find entrance through the pupil into the interior of the eyeball, where each of them is by refraction made to converge to a point, called the focus, which, falling exactly on the retina, forms a distinct image thereon of the point *a* of the external object from which the pencil of light emanated. (See page 21.) This is what takes place at least in the eye in its normal state (See page 23); but when there is any deviation from this state, and the condition of the eye is such as to bring the rays of each pencil of light to a focus at the line *c* or *d*, no distinct image can in this case be formed on the retina; since, when the focus occupies the place of the line *c*, the rays in meeting the retina are again divergent; and, when the focus is situated at the line *d*, the rays in meeting the retina are not yet brought into union with each other. The first case occurs in a near-sighted, and the second in a far-sighted eye. (See page 168.) The lines *e* represent only the principal rays of each pencil of light reflected to the left eye.

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PART THE FIRST.

ANATOMY AND PHYSIOLOGY OF THE EYE ;
IMPORTANCE AND DIGNITY OF THIS ORGAN ;
AND ITS EXPRESSION AS INDICATIVE OF
CHARACTER.

CHAPTER I.

ANATOMY OF THE EYE.

IN this chapter I shall present to the reader a brief and general view of the structure of the eye, describing its several parts and appendages, their relative position, and the purposes, so far as they are mechanical, which they are intended to fulfil.

To defend and secure the eye, the noblest and most delicate of the organs of sense, from external injuries, the all-wise Author of nature has so formed the face, that the projecting bones of the forehead, nose, and cheeks, form, as it were, a wall or rampart, which in conjunction with some other bones of the head, seven in number, is continued backwards in such a manner as to form a deep, firm, and conical cavity, of about an inch and three quarters in depth, which is named the orbit or socket of the eye. In this socket lies the eyeball, with its muscles, vessels, and nerves, imbedded in adipose substance. At the posterior or pointed part of the cavity is found a round hole (*foramen opticum*), together with two fissures which run towards the fore-part, and by which the different nerves and blood-vessels enter the cavity. At the inner edge of the orbit, quite close to the nose,

there is an excavation or groove, forming the opening of a canal, which runs down in a perpendicular direction into the interior of the nostril, affording a channel or outlet for the tears, and thence named the lacrymal canal.

The anterior and wider opening of the orbit is closed by parts of soft texture, so that the eye-ball is covered and protected in front likewise against external injuries, as instanced, more particularly, in sleep. These soft parts are divided in the middle by a horizontal slit into two moveable parts, which form the upper and lower eyelids. The skin of the face is continued over the eyelids, from the free edges of which the eyelashes shoot forth. That portion of the skin, which is continued from the forehead over the upper and most prominent edge of the orbit, is planted more or less thickly with hairs, forming the eyebrows; and in the same situation, underneath the skin, is found a muscle* which moves and corrugates the eyebrows. Beneath the skin of the eyelids there is a flat circular muscle, the office of which is to close them; but as the upper lid is larger than the lower, and endowed with greater mobility, and some power is required for its elevation, it is provided besides with an ex-

* A muscle consists of a great number of fleshy fibres, united together by cellular tissue into a fascicle, which is surrounded by a delicate membrane, and is interspersed with nerves, blood-vessels, and absorbents. It possesses an inherent property of contraction and relaxation, and thus has the power of moving the parts to which it is attached.

clusive muscle of its own, which, rising at the back of the orbit near the foramen opticum, runs forward to the eyelid and serves to raise it. Beneath the circular muscle, both in the upper and lower lid, is placed a small cartilage, for the purpose of keeping the eyelids extended in their proper form. A great number of very small glands (*glandulæ Meibomianæ*) are situated along the free edges of the lids.

At the margins of the eyelids, near the eyelashes, the skin of the face changes its character, and becomes a delicate lubricated membrane, which is continued over the internal surface of the lids, and also over the anterior visible part of the eyeball; thus forming a connecting membrane, which has, accordingly, received the name of the *conjunctiva*. At the inner canthus or nasal angle of the eye, this membrane forms a small semilunar fold, near which lies a gland (*caruncula lacrymalis*), appearing like a little red fleshy excrescence. In the neighbourhood of this little fold, at the free edge, both of the upper and the under eyelid, two little points or openings (*puncta lacrymalia*) are discernible. Through these openings the conjunctiva is continued in the form of two minute and delicate tubes, and, having formed the lacrymal sac and the lacrymal duct, which are situated in the bony canal, loses itself in the membrane that lines the interior of the nostril; so that the mucous membrane of this organ is a continuation of the

conjunctiva. Upon the lacrymal sac is found a little muscle which moves it, and thus propels the tears into the nostril. Through the continuation of the conjunctival membrane into the nostril, the organ of sight is brought into the most intimate connection with the organ of smell.

In order to present us with a clear and lively idea of the construction of the organ of sight, the eye-ball, which is of a spherical form, and only a small part of which is perceived from without, may be not unaptly compared with a watch. The external coat or white portion of the eyeball is a very firm, tough, leather-like membrane, which makes up about five-sixths of its spherical surface, protects the more delicate parts composing the interior of the globe, gives it its form, and serves for the attachment of the muscles which move the eye-ball; this corresponds to the outer case of the watch, and is named the *sclerotica*. Closely and firmly united with the sclerotica on the anterior hemisphere of the globe is a highly transparent membrane of a horny texture, which is thence named the *cornea*: it fills up the remaining sixth of the spherical surface of the eye-ball, and corresponds to the glass of the watch. The dial-plate is represented by the *iris*, which with its various shades and gradations of blue and brown, is seen clearly through the transparent cornea, as in the watch the dial-plate is seen through the glass. The iris is a circular membrane of peculiar texture, abounding in nerves

and blood-vessels, and is attached at its circumference by means of a dense texture, called the ciliary body, to the sclerotica, immediately behind the union of the latter membrane with the cornea, the rest of the membrane being loose and moveable. The iris has, nearly in its centre, a circular aperture, which is called the pupil.

As in the watch there is an intervening space between the glass and the dial-plate, so also is there in the eye between the cornea and the iris; but there is, moreover, behind the iris, a space similar to that in front of it; the one is named the anterior, and the other the posterior chamber of the eye. Both these chambers are filled with a clear watery fluid, called the *aqueous humour*, having a communication through the pupil, which is constantly open. As the works of the watch lie behind the dial-plate, so also the most important parts of the organ of sight are found behind the iris. Close behind the iris and the posterior chamber of the eye, a gelatinous, very transparent body is situated. Its form is that of a lens, the diameter of which, in the human adult, is four Parisian lines, and its thickness at the centre two lines; it is named the *crystalline lens*. It is inclosed in a transparent, delicate, membranous capsule, between which and the lens a slight vaporiform moisture exists, called *humor Morgagni*; the whole, taken together, is termed the lenticular system. The anterior surface of this lenticular

system is moistened by the aqueous humour of the posterior chamber of the eye; the hinder surface is imbedded in the *vitreous body*. This latter body consists of numerous small cells formed by the interlacing of a very delicate and transparent membrane, all of which are again inclosed in a fine investing membrane. Each of these cells is filled with a very clear and transparent fluid. The vitreous body constitutes about four-fifths of the contents of the eyeball; the remaining fifth is made up by the lenticular system, the two chambers, and the iris.

The whole of the vitreous body, with the exception of the anterior part, in which the lens is imbedded, is surrounded by a thin transparent layer of nervous substance, named the *retina*, which converges to a point nearly at the centre of the posterior hemisphere of the eyeball, and constitutes the true sensitive portion of the visual organ, and the first link in the chain upon which the act of subjective vision* depends. Between the retina and the sclerotica is spread a vascular membrane, called the *choroid coat*, which is composed of a great multitude of arteries and veins, shooting both laterally and posteriorly into the eyeball, and dispenses warmth and nourishment to the eye. The internal surface of the choroid coat is of a dark-brown colour, occasioned by a pigment, commonly

* Vide Chap. II. Sect. 2.

called *pigmentum nigrum*, with which the posterior surface of the iris is also covered; for the same purpose as that for which the interior surface of every optical instrument is blackened, viz. to prevent reflection of the rays of light. The whole interior spherical surface of the eyeball is consequently hung, as it were, with dark tapestry; on which account the pupil, serving as the sole avenue of light to the interior of the eye, appears black.

The retina converges to a point, as has been already observed, in the interior of the eyeball, and at its posterior hemisphere, nearly opposite to the pupil. Here it loses itself in the nerve of sight or *optic nerve*, so that it may be regarded as the immediate expansion of this nerve. This nerve is composed of numerous fibrils, each inclosed in a fine membrane, and the whole enveloped in a membranous sheath: it issues from the sclerotica as a nerve of about the thickness of a common quill, and runs through the round hole at the back of the orbit before mentioned, quite through into the cavity of the skull. Immediately after the entrance of the nerve into the skull, the nerves of both eyes meet and enter into a union of a very remarkable and important kind; inasmuch as the inner halves of the two nerves cross each other, the inner half of the right nerve proceeding to unite itself with the outer half of the left, and the inner half of the left nerve with the outer half of the right, while the outer halves do not cross, but re-

main on either side of the point of union. To this crossing of the nerves the name of *chiasma nervorum opticorum* has been given. After thus uniting they are again separated, and appear as two distinct nerves, the one pursuing its course on the right side, and the other on the left, towards the innermost part of the brain, with the most important portions of which it amalgamates itself. The organization of these nerves differs from that of all other nerves, and is so peculiar, that the optic nerves must rather be regarded as a direct continuation of the substance of the brain to the interior surface of the eyeball, *i. e.* to the retina. A number of small nerves (*nervi ciliares*) penetrate the sclerotica from without, and run between this membrane and the choroid to the iris, while different nerves go to the muscles and the rest of the parts surrounding the eyeball. All these nerves are derived from the brain, form communications with each other, and unite also with the great sympathetic nerve, which latter nerve is again intimately connected with the spinal chord. These direct or indirect communications with the different divisions of the nervous system are of the greatest importance, as the eye is brought by their means into the most intimate relation with the whole circle of sensation of the entire body.

Nearly corresponding with the nerves, a number of arteries and veins run likewise to the eyeball and its surrounding parts. These vessels ramify

in various directions, and, in the choroid coat, present the appearance of net-work. The central artery takes a very peculiar course; exteriorly to the eyeball, and at some distance from the sclerotica, it inserts itself obliquely into the optic nerve, then runs through its centre, straightforwards, in the direction of the axis of the eyeball, and finishes by giving off some branches to the vitreous body, and to the posterior surface of the capsule of the lens. Here, as generally throughout the system, the arteries carry out a bright red blood to the parts with which they are connected, while the veins bring back blood of a dark colour from those parts to the heart. Many of the vessels of the eyeball are of such delicacy that they are not to be distinguished in the healthy eye, but only become visible in disease.

The apparatus for moving the eyeball consists of six muscles, four of which, the straight muscles, have their origin at the back of the orbit round the foramen opticum, and are attached to the sclerotica in antagonist directions, viz. above and below, and on either side, so that the one can move the eye upwards, the second downwards, the third to the right, and the fourth to the left side. The other two muscles, the superior and inferior oblique muscles, rising from the interior wall of the orbit, and attached also to the sclerotica, but in an oblique direction to the former, move or turn the eye round its horizontal axis. These six muscles not

only serve the purpose of moving the eye, but also keep it firm and in its proper place in the socket.

In the forepart of the orbit, towards the temples, and near the eyeball, is situated the lacrymal gland, which has several minute orifices opening on the interior surface of the upper eyelid, through which the tears issue. The eyeball, with all its parts, lies in a soft bed of adipose substance, which fills up the whole of the interval between them and the orbit.

CHAPTER II.

PHYSIOLOGY OF THE EYE.

By Physiology is understood the science which treats of the structure and functions of organized bodies, and more especially of the human body; to this science, therefore, in furtherance of our design, we must have recourse for the explanation of the uses and functions of the various parts of the organ of sight, and of the mode in which vision is effected by them.

In the organization of the living body, the various systems and organs of which it consists stand in reciprocal dependence upon each other. The activity of one system promotes that of a second, the functions of one organ stimulate those of another, and so forth; so that the intimate connexion of all the actions and the successive series of all the functions constitute a perfect circle, which is termed organic life. This life has its origin in the maternal bosom, but as soon as the human being has emerged from this obscurity into the light of the external world, the life of the senses is at this very moment awakened; and as the organic life was derived from the mother, so is

the life of the soul developed from that of the senses through the contact and communication of man with the external world. Still it is but one power, the *vis vitalis*, the *ενορμῶν* of Hippocrates, which produced and which maintains this threefold life, which by degrees becomes more and more centred in the mind; and thus the mind has, or is at least intended to have, the predominance, and to modify and determine the condition of man with regard to the world.—The contact of man with the external world is a reciprocal relation between the two, which in man consists, besides nutrition and assimilation, in sensation and voluntary motion. The action of the external world occasions sensation; this produces perception and an idea in the mind; and again the idea is succeeded by a bodily movement, which has for its consequence an action upon the external world. Sensation is effected through the medium of the senses, and the organs of sense therefore are not merely nominally, but actually *organs*; that is, instruments or means which the mind uses for its own purposes.—With regard to eternity and infinity, the soul is permitted to indulge in conjectures and aspirations only; but all ideas connected with time and space are the result of a contact and intercourse betwixt the soul and the external world, as is proved by every operation wherein one or more of the senses are implicated, although we are just as little able to

understand the nature of that contact and intercourse as we are in a condition to investigate the nature of the soul itself.

To return after this digression to the sense of sight, let us represent to ourselves an individual with his eyes closed, in whose mind the desire of seeing any external object has arisen. In this case the faculty of the mind which is first called into action is the will; this excites muscular motion, which is followed by a series of functions and actions in rapid succession. At the moment of volition the eyelids first open through the influence of the nerves upon the muscles, the eye moves and directs itself towards the object which the mind wishes to view, and several changes are occasioned in the interior of the eyeball by the stimulus of light. The external world has now become visible to the individual, and he is therefore placed in a condition, as far as regards the objects themselves, to occupy himself with the things around him, and to act upon them according to his subsequent will.

Thus the eyelids may be compared to a pair of curtains hung between the mind and the external world, which they alternately unfold to, or veil from the view. But they serve likewise as a defence against external injuries, whose influence they keep off during sleep, as also while we are awake, by closing quickly, for instance, on the approach of any small insect. As these sources of injury, such as particles of dust, &c., enter the eye for the most

part from above, the upper lid is the larger, and has moreover a wider compass of motion. The opening and closing of the eyelids, together with the motions of the eyeball, exercise a stimulus upon the lacrymal gland, which augments the secretion of its fluid in the neighbourhood of the outer canthus of the eye and on the inner surface of the upper lid. This fluid is then diffused by the act of winking over the whole of the anterior hemisphere of the eyeball. It is this which gives the eyeball its lustre, moderates the effect of noxious airs, keeps it cool by its constant and partial evaporation, and, lastly, facilitates the motion of the eyelids. After having fulfilled this office for the eye, it collects itself in the inner canthus of the eye, which for this purpose is of a semilunar form. Here, after being mixed with a peculiar fluid secreted by the *caruncula lacrymalis*, by which it is rendered milder, it is absorbed by the *puncta lacrymalia*, and carried through the lacrymal duct into the nostril, where it has a new office to perform. When the lacrymal gland is excited by any external cause, or rendered more than ordinarily active by any affection of the mind or body, it secretes a greater quantity of this moisture than the *puncta lacrymalia* are able to absorb, in consequence of which the fluid runs down over the cheek in the form of tears.

The eyebrows and eyelashes, besides serving as ornaments to the face, and contributing to the

expression of the mental character and emotions, as portrayed by the eye, have also for their object to shade this organ, and by this means, especially when the former are contracted and bent down, moderate the stimulus of light when too strong for the eye. Besides this, they prevent the condensed perspiration which flows down from the forehead, and particles of dust or other substances floating in the air, from entering the eye. For this reason well-formed eyelashes, when the lids are closed, as in sleep for instance, are locked into each other, in the same manner as the fingers when the hands are folded.

We may now proceed to consider the sense of sight, *first*, under the head of objective vision, *i. e.* an optical process dependent upon the external world, together with the visual apparatus; and *secondly*, under the head of subjective vision, *i. e.* a mental act, dependent upon the mind, together with the optic nerve in its whole extent.

§ 1. *Objective Vision.*

The first necessary condition for objective seeing, diffused universally throughout nature, is light—for where there is no light there is no vision; the second is the visual apparatus, by which is to be understood the transparent media,

the iris, and the pigmentum nigrum. It would be foreign to our purpose to enter into a minute investigation of the laws of light; but there are three of those laws which claim our attention in this place; first, as to its transmission; secondly, as to its colour; and thirdly, as to its refraction by transparent media.

I. Certain bodies in nature are self-luminous, such as the sun, and all terrestrial bodies during combustion. From these light is emitted, and spreads itself in all directions in straight lines, commonly called rays. When any of these rays reach our eye directly or immediately, we see the luminous body itself. When any of the rays arrive at the surface of an opaque body, they are intercepted, and partially reflected according to certain optical laws, viz. at the same angle as that of their incidence, and the opaque body is now illuminated, and for the sake of distinction is called a non-luminous body. When the rays of light thus reflected reach our eye, the illuminated body becomes visible to us.

II. Light, or rather every ray of light, consists of three primitive colours, blue, yellow, and red. If the surface of an illuminated object be of such a nature as to reflect the ray of light with an equal mixture of these three colours, it will appear white, and the more equal and intimate the mixture, the whiter will be the colour. If, on the contrary, the illuminated surface be of such a

nature as to decompose the ray and separate either of the three primitive colours; if now it attracts two of these colours to itself, or in other words, absorbs them, it appears of the third, or remaining colour, which not having been absorbed is reflected: for example, if the blue and yellow be absorbed, the object appears red. But if the object have the property of absorbing one only of the primitive colours, it will then appear of that colour which results from a mixture of the two reflected colours; if, for instance, the red be absorbed, the colour of the object will be green, which results from the mixture of yellow and blue. From the respective degrees in which one or other of the primitive colours predominates in the mixture of the reflected colours, arise the infinitely various gradations and shades of colours, or light. Lastly, if the surface of the object possess the property of absorbing all the three primitive colours, it will then appear black, which will be the more deep and intense, the more perfectly and equally they are absorbed. The object in this case is, indeed, illuminated, but reflects no light. *

III. When a ray of light falls upon any transparent body, such as water or glass, at right

* A prism, as is well known, separates the ray of light both into the primitive and the mixed colours, which arrange themselves in the following order :—red, orange, yellow, green, blue, indigo, and violet.

angles to its surface, it proceeds straight through it in the same direction; the ray is not intercepted by the substance. But when the ray falls obliquely upon the transparent body, it suffers refraction at the surface; that is to say, it assumes on its entrance a somewhat different direction, which direction is maintained in its progress through the body, but on passing out of the latter is again changed. This property of transparent bodies is named their refractive power, which differs according to their various degrees of density and combustibility; the greater the density or combustibility, the greater the refractive power. *

It is by the first two laws of light which we have adduced, that the external world and its various objects, with their infinitely diversified colours and shades, are rendered visible; by the third, inasmuch as it is applied in the visual apparatus itself, the eye is placed in a condition to behold the external world and those various objects.

* The following experiment affords an illustration of this law: Let a stick be held in a pretty good sized vessel filled with water in such a manner that the one half of the stick be immersed in the water. If the stick be held so as to form a right angle with the surface of the water, it will appear straight; but if it be held obliquely, it will appear broken at the surface of the water, and will have apparently a different direction in the water. If oil be employed for the experiment instead of water, the appearance will be much more striking, on account of the greater density and combustibility of the oil.

From the first of these laws it is evident that some of the rays of light, whether proceeding from self-luminous, or from illuminated bodies, must reach the eye when turned towards the objects. These rays come in a diverging direction to the eye; that is, they have the form of a cone, whose apex is at some point of the object, whilst its base is at the cornea of the eye. Such of them as find entrance through the pupil into the interior of the eye, proceed through its transparent media, viz. the aqueous humour, the lens, and the vitreous body. These media differ from each other in density, which in all of them exceeds that of the atmospheric air; they have therefore a great refractive power, which is moreover considerably increased by the double convex form of the lens.* The effect of all this is, that the rays of light are necessarily refracted and made to converge in the interior of the eye. This convergence of the rays again presents a cone, whose point rests on the concave surface of the posterior hemisphere, *i. e.* on the retina, whilst its base is on the anterior hemisphere, *i. e.* on the cornea. The point on the retina is called the focus. The point of the external object from which the rays diverge is thus

* The effect of a lens, or common burning-glass is, as is well known, to collect the rays of light falling on its surface, and to unite them at one point, to which the Latin term *focus* (fire-place) has been applied, on account of a considerable degree of heat being produced at that place by the concentration of the rays of light.

truly represented through the refraction and convergence of the rays at the bottom of the eye, by a point exactly corresponding to that of the external object. But since every point of the object sends rays to the eye in the same manner, these must accordingly present just as many foci on the retina, and as the points in the object lie close to one another, the foci at the bottom of the eye must also occupy exactly the same relative position among themselves, as those points in the object. Hence it follows, as a matter of course, that the object must form an exact image, though upon a greatly diminished scale, in the interior of the eye, namely, at the interior and posterior hemisphere, or on the retina, just as the picture of a landscape is presented on the table of the camera obscura.

But, farther, it is an ascertained fact,* that this image is presented *inverted* on the retina; and the reason of this inversion is, that the rays of light which come from the upper part of the object are refracted in the eye towards the lower part, those

* Of the truth of this fact any one may easily convince himself. Let him take, for example, the eye of a white rabbit, from which the muscles and all the fat have been entirely removed, and let a lighted candle be held at some distance before the cornea. If the hinder hemisphere of the eye be now closely examined, an inverted image of the flame will be seen shining through the sclerotica, with its point directed downwards and its base upwards. In order to see this image distinctly, which shines through but faintly, the eye must be closely fitted into a hole bored in a tolerably large screen, by which means its posterior hemisphere is shaded and darkened.

coming from beneath towards the upper part, those from the right on the left, and those from the left on the right hand. If the construction of the eye be considered, it will be evident to any person acquainted with the principles of optics, that this must be the case; its explanation belongs therefore to that science.

In a well-formed eye, that is to say, an eye whose construction is perfectly adapted to the purposes of vision, this image falls exactly upon the retina, and it is necessary that this should be the case, in order that a distinct perception may be produced upon the nerve. This exact coincidence is effected in the most perfect manner by means of the refractive media, the form of the eyeball, and extremely minute changes of its form, and no doubt of some of its internal parts. These changes are regulated according to the divergence of the rays of light, which of course varies with the distance of the object from the eye. This capacity of change is dependent upon the vital energy of the eye, a property which is truly worthy of admiration, but the intimate nature of which has not yet been sufficiently investigated. When there is any deviation from the normal state, either in the quality of the refractive media, in the form of the eye, or in its power of adjustment, the image does not fall exactly upon the retina. Hence arise short-sightedness and far-sightedness, both of

which will be treated of at length in the second part of this work.

The quantity of the rays of light which enter the eye through the pupil, or the degree of light to which the interior of the eye is exposed, is by no means a matter of indifference for the organ of sight, with reference to the production of distinct vision.

In strong light, the eye is acted upon in such a manner that the iris is expanded and becomes broader, in consequence of which the pupil is of course contracted, and becomes narrower and smaller. Weak light has an opposite effect.* In strong light, therefore, fewer rays enter the eye, owing to the contraction of the pupil, whereas, when the light is weaker, a far greater number are admitted by the dilatation of the pupil, so that the degree of light in the interior of the eye remains almost always the same, which is of importance for the distinctness of the image in the eye. Those rays of light which are not allowed by the iris to enter the eye, are reflected from the cornea and iris. From the capacity which the iris pos-

* The iris is not endowed with the power of voluntary motion, but may be influenced by other causes besides the stimulus of light; it may be excited, even when there is no alteration in the degree of light, by agents which affect the nervous system, as also by emotions of the mind. This is seen most evidently, for instance, in the eye of birds, under the influence of fear, terror, or anger; and in parrots even a voluntary motion of the iris may be observed.

sesses of thus regulating the quantity of light admitted into the interior of the eye, it may be regarded as a photometer for the eye. And that it may answer this purpose still more perfectly, its posterior or interior surface is covered with a dark-brown colouring matter, which has been before mentioned under the name of *pigmentum nigrum*. This colouring matter is continued between the retina and the choroid coat throughout their whole extent, so that the interior of the eye is darkened, and the organ of sight in this sense becomes a *camera obscura*. It was necessary that the interior of the eye should be dark or black, because this is the only colour adapted to prevent by its absorption of the rays any further change or refraction of the light, after the formation of the image upon the retina. The presence of this colouring matter on the posterior surface of the iris has, moreover, for its object, to prevent the light which meets its anterior surface from shining through it into the interior of the eye. The darker or lighter colour of the iris is owing to the greater or smaller quantity of this pigment which may be present, and dark eyes are enabled by it to endure a stronger light than those of lighter colour, although the latter can support more exertion. The eye of Albinos accordingly is absolutely unable to endure bright light, because the dark pigment is entirely wanting.

It will not be superfluous to recapitulate briefly

the uses of the several parts of the eyeball. The sclerotica gives to the eyeball its form, and firmness for the attachment of its six muscles; the choroid provides for its nourishment and warmth; the transparent media refract the light, and by causing the convergence of the rays form an image accordant with the object, which image is received by the retina; the iris and the dark pigment moderate the light, and contribute to the distinctness of the image.

§ 2. *Subjective Vision.*

From the foregoing description of objective seeing the eye might well be regarded merely in the light of a highly perfect optical instrument, and the more so, as the refractive media form in fact nothing more than what is called a compound lens. Now, as an optical instrument is only a means by which objects that are scarcely recognised by an unassisted eye, are rendered distinctly visible to it; so also is the organ of sight only an instrument or means through which the impression made by an external visible object upon that organ is perceived by the mind. The eye, when looking through an optical instrument, receives only the image of objects, and consequently remains merely passive; but the mind, looking as it were through the eye upon the external world perceives it, and thus is active. By means of the eye there is an inter-

course established between the world without and the mind within, and the objects in that world when seen are, by the unlimited self-activity of the mind, perceived, compared, and determined.

The eye then is an instrument of the mind, and the manner in which it is used by the mind constitutes subjective seeing. The necessary condition for this is, first, the energy of the nerve of sense throughout its whole extent, viz. both as the retina and as the optic nerve continued into the interior of the brain; and, secondly, the self-activity of the mind. With regard to subjective seeing, there exists therefore the same relation between the mind and the nerve, as exists in objective seeing between the external world and the apparatus of vision.

Now, the apparatus of vision may in itself perfectly fulfil its purpose; that is to say, may exhibit an image of the object in the manner before described upon the retina, yet it does not follow that the eye must see the object; as is the case, for instance, in perfect amaurosis, in which the image upon the retina is not wanting, but the retina itself is paralysed. The activity of the retina, therefore, which consists in its sensation of the image, is the essential condition necessary for seeing. The sensation of the image is carried onwards from the retina through the optic nerve to the brain, and here, in the organ of the mind, the cause, which has produced the sensation, becomes

known ; or, in other words, the self-activity of the mind forms an idea of the object, which is now perceived. Since, now, in a perfect and cultivated sense of sight, seeing and perception are one and the same, the impression made by external objects upon the retina through the medium of the visual apparatus must occur simultaneously with the sensation of this impression, and with the idea formed by the mind of the cause which produces the impression ; that is, to effect perceptive vision all the functions of the sense of sight both as regards the eye and the mind must cooperate and concur. Seeing therefore is in effect nothing more than a mental touching* at a distance through the me-

* I use here the term *touching*, because there is in several points of view a great sympathy between the sense of sight and that of touch, or general perception, as is proved by the fact, that whenever the one sense is highly developed, it is always at the expense of the other ; where the sight is acute, the sense of touch is obtuse, while on the other hand, when the power of vision is diminished in an extraordinary degree, the general perception is proportionally increased. Professor Juengken of Berlin related to me the following very interesting case of congenital night-blindness, which came under his own observation, and will serve to illustrate this point. A young gentleman, in good health, whose eyes had no organic defect, could see perfectly well in the day time ; but when evening came on, he was unable to distinguish more than the outlines of larger objects, and those but imperfectly, even when most brightly illuminated by gas or any artificial light. In proportion as his sight failed, his general perception acquired such a degree of acuteness, that he became sensible of the presence of every object which he approached, while at some distance from it ; and by this means was enabled to move about with security in crowded places. He described the sensation which he experienced

dium of the eye, and by the help of the rays of light; and visual perception is the formation of an idea of the object gained from visual sensation.

Now, however intimately this idea and this sensation may be blended with each other, and therefore may appear at first view to be as one and the same, they are yet, on closer examination, considerably different in character and value. The difference is apparent of itself from the meaning of the words, if taken in their original and strict sense. Sensation is that state in which the mind merely becomes conscious of an impression made upon the body, especially upon the nerve. Idea, on the contrary, is a particular kind of thought, in which

on approaching any object, as that of something pressing gently, or breathing upon him. On the return of day, his sight was again restored, and the sense of touch reverted to its normal state.

The sense of sight, when lost, or when the necessary condition for its exercise—light—is wanting, is always in some degree compensated by the sense of touch. The blind man, for instance, endeavours to supply its deficiency by touching, and those who possess the faculty of sight have recourse to feeling when in the dark. Dr. Mackenzie† relates a case of a child, whose eyelids had been closed continually for more than a year in consequence of a strumous complaint. “When the complaint had abated,” says he, “the child groped with its hands, as if blind, although it saw; so strongly confirmed was the habit of using the sense of touch in preference to that of sight.” It has been frequently asserted that there exists the rudiment of an eye on the horn of snails; in these animals therefore the eye would be at the same time an organ of touch and an organ of sight. In animals without eyes, feeling is substituted for the sense of sight.

† Practical Treatise on Diseases of the Eye, Second Ed., page 453.

something individual is conceived and understood by the mind. If now this individual object of thought be material, viz. excited through the medium of sense, the idea is derived from sensation. As soon as the sensation has produced consciousness, an idea is formed by reflection upon the sensation, and this constitutes perception of the material object in the mind. But now that such a difference between sensation and perception, as originally derived from sensation, does exist not merely in empty terms, but in reality, is manifest from the fact, that they sometimes occur not simultaneously with each other. When a person, for instance, is buried in abstract thought, the attention of his mind is withdrawn from impressions made on the organs of sense. Light through the open eye, sound through the open ear, produce each their proper impression, yet the individual neither sees nor hears, because the mind does not pay attention to the impression; if, however, the mind be aroused from its reverie, that is, if its attention be called to the impression before the sensation of that impression is effaced from the nerve, the sensation produces consciousness, and an idea being formed in the mind, perception takes place. Thus it frequently happens in such cases that a suitable answer is given to some question which had been asked long before, to the great surprise of the inquirer. Thus also the mathematical calculations, in which the mind of Archime-

des was absorbed, prevented him from hearing the storming of Syracuse.

An impression made on the retina or optic nerve places this nerve in a peculiar and active condition, which being felt by the brain is then perceived by the mind. This property of being placed in such a condition is termed its energy. When this energy is excited, the sensation of light is experienced. The difference in the quantity of excitement causes the sensation of the various degrees of light, viz. brightness and shade ; and the difference in the quality of excitement gives rise to the sensation of the various kinds of light, viz. colours. If the excitement is totally wanting, the sensation of light will be also wanting, which state is that of darkness. The only sensation therefore which the optic nerve is capable of experiencing, consists exclusively in light; for the sensation occasioned by visible objects is produced only through the medium of light. Now the activity of the optic nerve is most usually excited by the rays emanating from a luminous body, but it may also be called into action by any other cause which stimulates that nerve. When the eyes, for instance, are placed in communication with the electric fluid, they perceive in the dark an appearance of light. Mechanical irritation, as pressure, or a blow upon the eye, produces the sensation of light. An injury so considerable as the cutting through the optic nerve, in the operation of extirpation of the

eye, often occasions a sensation as if large masses of fire were seen. The accumulation of blood in the vessels of the eye occasioned by a congestive state, or by inflammation of that organ, causes a pressure upon the optic nerve or retina which is perceived as an appearance of light or fire. Lastly, even the influence of medicinal substances, of narcotics, for instance, as foxglove, &c., when they are carried into the circulation excites the sensation of a glimmering light before the eyes.

I have said that visual perception is the formation of an idea of a visible object gained from visual sensation. Since now a pure visual sensation consists only in that of light, any idea merely derived from visual sensation can of course only exist with reference to light, viz. its degree and its kinds, and we may add, with reference to the extent of surface, when illuminated; for only in this case can the surface make an impression on the retina. We are able, for instance, to distinguish a triangular from a quadrangular surface by the sight alone; the idea, however, as far as regards the size of the surface, is subject to some deception, and therefore indefinite.* A definite and accurate idea con-

* I must here advert to the question proposed by Mr. Molineux to Mr. Locke, which has been since frequently discussed,† namely, “whether a person who had been born blind, and who had learned to distinguish a cube from a sphere by his touch, would, on acquiring the use of sight, be immediately able to tell the

† Locke’s *Essay concerning Human Understanding*, Book II, chap. 9, § 8.

cerning the bulk of a body, and its form according to its three dimensions, can only be formed by reflecting on the impressions made both upon the sense of sight and the sense of touch. From the frequent seeing and feeling of things which are familiar to us, the two sensations become so intimately blended with each other, that on the recurrence of the objects to our view the sensation belonging to the sense of touch unites itself in the mind with that of the sense of sight, and it is not necessary for us to feel them again, but only to see them, in order to recognise them. But if we wish to have an accurate idea of the form of an object with which we are unacquainted, when presented to us for the first time, it is always necessary both to see and to feel it. Thus an unpractised eye will regard a globular body at a distance as a mere disk; feeling corrects the visual sensation, and thus by reflecting on both impressions the idea of the spherical form is obtained. Persons who have not been accustomed to view

one from the other, before he touched them." Both these gentlemen have answered this question in the negative, but it does not admit, strictly speaking, of being either entirely affirmed or denied. The supposed person will certainly be able to distinguish by his sight the cube from the sphere, though he will not, it is true, recognise the two figures as a *cube* and a *sphere*, but will pronounce the one to be a *disk* and the other a *square*; it must be premised, however, that some little time must be allowed for the mind to recover from the confused sensation produced by the novelty and multitude of objects suddenly presented to the newly acquired faculty.

objects by reflected light, suppose the objects which they see by reflection to be behind the mirror. This is observed in animals, and also in savages, and children, who, in order to convince themselves concerning the object seen, look and feel for it behind the mirror. The same is the case with an object lying in the water, a correct idea as to its true position, size, and form, is only gained by the touch.

An idea of the distance of the object from the eye may certainly in some degree, as in the former case, be formed from sight alone, so far as the distance is estimated according to the strength of the light coming from the object to the eye, but this idea, like the former, is always indefinite. A definite idea of distance, as well as of form and size, is only obtained by sight and touch, and by reflecting on the impressions made on both senses; but for this purpose we must take into account the muscular motion and voluntary locomotion of the individual.—Caspar Hauser,* in a detailed account of his own experience in this respect states, that upon his first liberation from confinement, whenever he looked through the window upon external objects, such as the street, garden, &c. it appeared to him as if there were a shutter quite close to his eye, and covered with confused colours of all kinds, in

* Feuerbach's Caspar Hauser—Beispiel eines Verbrechens am Seelenleben eines Menschen. Anspach, 1832. page 79, &c.

which he could recognise or distinguish nothing singly. He says farther, that he did not convince himself till after some time during his walks out of doors, that what had at first appeared to him as a shutter of various colours, as well as many other objects, were in reality very different things; and that at length the shutter disappeared, and he saw and recognised all things in their just proportions. Persons born blind who obtain their sight by an operation in later years only, sometimes imagine that all objects touch their eyes, and lie so near to them that they are afraid of stumbling against them; sometimes they leap towards the moon, supposing that they can lay hold of it; at other times they run after the clouds moving along the sky, in order to catch them, or commit other such extravagancies. A very interesting case is recorded by Cheselden,* of a person who having been born blind was successfully operated upon in the fourteenth year of his age. The case is well worthy of being read by those who take an interest in this subject.

Since ideas are gained by reflection upon sensation, it is further necessary in all cases, in order that an accurate idea of objects may be formed from the sense of sight, that the powers of the mind should be unimpaired, and undisturbed in

* Philos. Transactions, 1728, page 447.

their exercise. A proof of this is afforded in the instance related by Haslam,* of a boy who had no defect of sight, but was weak in understanding, and who in his seventh year was unable to estimate the distances of objects, especially as to height; he would extend his hand frequently towards a nail on the ceiling, or towards the moon, to catch it. It is therefore the judgment which corrects and makes clear this idea, or perception of visible objects.

We have hitherto considered the ideas that relate to visible objects as being derived from visual sensation, which is produced by actual impression of an object upon the organ of sense; but they may also, without being produced by any such impression, be called forth by the self-activity of the mind alone. For this purpose, however, it is absolutely necessary that such ideas as are derived from visual sensation should have been previously formed in the mind; for, where visual perception, as derived from visual sensation, is wanting, *i. e.* where such ideas never existed, the ideas of objects which produce impressions through the sense of sight alone, are also totally wanting to the imagination. Thus no person who has been blind from his birth is able to form any idea of colours; though he may form ideas about all other quali-

* Haslam's Observations on Madness and Melancholy, 2 Ed. p. 192.

ties of bodies, those of their pure visible qualities are still wanting; neither does he ever dream of these qualities, because he has never had any perception or idea of them as derived from pure visual sensation.

Ideas that lie dormant in the mind may thus be revived—*first*, by the memory, either involuntarily, as instanced in the most striking manner in dreams, in which the images of objects that have been seen before re-appear distinctly before the eye; or voluntarily, when for instance we form at pleasure in our own mind a vivid picture of objects with which we are acquainted. This is most evidently instanced in blind persons, who were not so from their birth, but have lost their sight in later years; they are able to represent to their minds every thing which they have formerly seen. *Secondly*, we can produce ideas of visible objects by the imagination. The imagination creates nothing actually new, since it has always obtained beforehand through the medium of the senses the materials with which it works, which it afterwards only puts together according to its own pleasure, and arranges in new forms *ad arbitrium*, but in all cases agreeably to previous perception. Thus the mathematician, while engaged in the scientific investigation of the laws of magnitude, sketches in thought his lines and figures. Thus too the conceptions of the painter or of the sculptor, before they are even begun to be embodied on the canvass

or in the stone, stand forth perfectly delineated and clothed with ideal beauty before his mental eye. This mode of producing ideas of visible objects is the parent of the plastic art. *Thirdly*, These ideas are excited by the affections and passions. Earnest desire brings distant objects before the eye, and anxiety and fear cause phantoms or spectres to be seen. The consciousness of having been an actor in the conspiracy on the Ides of March; disappointment as to the consequences of that action; anticipation of an obstinate struggle in the field; apprehension as to the issue of the contest, and the conviction that the fate of his country and of himself depended thereon: such causes were powerful enough to affect in an extraordinary manner even the manly spirit of Marcus Brutus, and to bring before his eyes the apparition of his murdered friend Cæsar. This may be sufficient to explain the impression entertained by the mind of Brutus, that Cæsar's spirit was his evil genius, which would appear to him again at Philippi: for the blow struck on the Ides of March had, far contrary to his intentions, involved his country in a civil war; and from the present position of affairs and his knowledge of the art of war, he could easily foresee that the fate of the Roman Republic, as well as his own, must be decided in the neighbourhood of Philippi. Thus with the probable termination of the war at Philippi, became connected the deed, perpetrated before Pompey's statue in the senate-

house, which had given rise to it, and the apparition of Cæsar rose before the anxious eye of the overwhelmed Brutus. Again, under the influence of the agitation of mind, which preceded the murder of the sleeping Duncan, Macbeth exclaims:—

“Is this a dagger which I see before me,
The handle toward my hand? Come, let me clutch thee :—
I have thee not, and yet I see thee still.
Art thou not, fatal vision, sensible
To feeling, as to sight? or art thou but
A dagger of the mind; a false creation,
Proceeding from the heat-oppressed brain?”

If we now turn our attention for a moment to the manner in which ideas respecting visible objects are formed from impressions made upon the sense of sight, it will be evident that their formation, or the perception of objects, depends upon a certain expertness of that sense, and that to see *correctly* is in fact an art.

A person born blind, who has gained his sight by an operation in later years, can only acquire correct perception of the true nature and condition of visible objects by instruction, and by repeated exercise of the sense of sight. He must therefore by comparing the things which present themselves to his view, and by reflecting on them learn to form for himself correct ideas concerning these objects, or in other words, he must *learn* to see. Just in the same manner also must every man learn to see during his childhood. But as instruction cannot be employed at the earliest period of life, it is only

by constant exercise that the child learns to separate and distinguish individual objects out of the chaos of things floating before his eyes, and to recognise and determine the distances, forms, and dimensions of bodies. It is observed, for example, that children, during the first few months after birth, when they wish to lay hold of their playthings, often make several ineffectual attempts before they succeed. The cause of this is, that they have not yet learned to bring both eyes into harmonious bearing upon the object, and accordingly they see every object double; if they now wish to lay hold of the plaything, they often extend their hand first towards the unreal object or illusion, which appears to be situated near the true object of sight. But when the child has learned by exercise to use both eyes in harmony with each other, he learns to see singly and correctly, and at the same time he is taught by experience to employ in a proper manner the organ of touch and the organ of sight for the same object, and consequently is able to grasp immediately the actual object of sight. Another proof of the necessity of exercise is this. The child stretches out his hand to lay hold of the flame of a candle, however distant it may be from him, and it is only by repeated practice that he learns to estimate and determine the distance of the object according to the strength of the light coming from it to his eye, and only after some experience that he

knows whether the flame of the candle, or any other object, is within or beyond his reach.

This exercise and the experience resulting from it are means by which the sense of sight is not only gradually developed and brought to perfection, but is also rendered independent of any other sense. It commences at a very early period of childhood, and the minute steps by which the sense proceeds imperceptibly towards perfection, as man acquires by degrees the power of reflection and self-consciousness, are entirely forgotten with all the other occurrences of early infancy, and at length in the grown-up person it has become a habit, or custom. "Habit," says Schiller, "is the nurse of man," but still it is *only* the nurse. Man therefore can with no greater justice be said to bring the art of seeing, than he can be said to bring his mother-tongue, into the world with him; he brings merely the capacity for it. Thus Voltaire* says, "Nous apprenons à voir précisément comme nous apprenons à parler et à lire." This capacity requires cultivation, which beginning in childhood, by no means ends with this period, but may be farther extended, according as circumstances, occupations, or the particular pursuits of individuals more or less favour it. As we advance in years, this cultivation goes on for the most part through the sense of sight alone, which has now become rela-

* Physique Newtonienne, Chap. vii.

tively independent; yet there are still some occasions on which it is necessary that the sense of touch should come to the aid of this sense; on the first occurrence, for instance, of objects with which we are entirely unacquainted.

Now as the sense of sight in its ordinary use is exercised upon light both in its degree and kind, and the relations of objects to space before mentioned, viz. their distance, form, and dimensions, it is brought by particular cultivation to different degrees of refinement and perfection; painters, for example, by the exercise of this faculty acquire a fine and delicate perception of the gradations and shades of colour, draughtsmen by the same means gain correct ideas of perspective, and military engineers accuracy and skill in the admeasurement of angles, distances, &c.

After these inquiries with which we have hitherto been occupied, there remain still two questions to be answered, which are of the greatest importance with respect to subjective seeing.

Since the image is presented in an inverted form upon the retina, as I have observed at page 22, how comes it that we nevertheless see the cause of this image, *i. e.* the object, in its true position, not inverted?—However contradictory to itself this fact may appear, it yet in reality requires no explanation; inasmuch as an inverted image not only of the single object, but of *the whole field of vision and of our own person* also, is formed upon the re-

tina. Where the whole is inverted, the whole must appear right, for the two ideas, viz. of erectness and inversion are only relative, and signify nothing, unless as being opposed to each other. Besides, it must be remembered that the idea in the mind is derived from sensation alone; the mind, in perceiving a visible object, is occupied merely with forming an idea from the visual sensation, and does *not compare the image* produced on the retina by the object, *with the object itself*. But, it will be said, the mind may institute such a comparison by the aid of the sense of touch. In the image of a man upon the retina, for example, the head will be downwards, and the feet upwards, whereas on touching him we find the head upwards, and the feet downwards. This apparent contradiction between the two sensations may be very simply explained, if we keep in mind that the idea of *upwards* is in point of fact of the same import as that of *sky-wards*, while that of *downwards* is the same as *earth-wards*. If therefore there is in the mind the intention of touching the head of the person, which in the image upon the retina is towards the sky, and produces a corresponding idea; the mind will naturally determine the organ of touch, *i. e.* the hand, to move itself towards the sky, *i. e.* upwards, and it will accordingly meet the head of the person. This applies equally the other way, viz. to the idea of downwards or towards the earth.

The second question is this: how comes it that with two eyes we see the object only single, and not double?—When we view an object with one eye only, it appears in the direction of a straight line joining the object and its image on the retina, and the image is by the retina, or by a property inherent in the sense, referred to the point where the line of visible direction meets the object. If we now direct both eyes towards the object, the two optic lines will concur at the same point of the object, and the two images of the object, viz. one to each eye, will therefore be simultaneously referred by the retina to the single point of concurrence of both optic lines; but as it is inconsistent with the laws of nature that two things can be at the same time in the same place, it follows that the object must be seen as one and the same, or single. There exists certainly an image of the object in each eye; but as the sensations of the two retinæ, caused by the images, are, in the present case, of a correspondent nature, and made in the same manner and at the same time, they must harmonize with each other in respect of this triple unity of nature, manner, and time, and will therefore naturally suggest to the mind one and the same idea, and thus a single perception of the object, though derived from the two visual sensations, takes place.

Since now it is owing to the intersection of the lines of visible direction that objects appear single when viewed with two eyes, objects situated either

before or beyond this point must of course appear double. This is a fact which may be easily proved: Fix both your eyes steadily on a part of the framework of a window; any remote thing behind it and in a line with the part of the window you are looking at, for instance, the spire of a tower, or a narrow chimney, will be seen double; if, on the contrary, you look at the remote object, the frame of the window will appear double. Again, hold two fingers at some distance and in a straight line, one behind the other, before your eyes; if you now look at the more remote one, that which is nearer to you will appear double, and if you look at the nearer one, the remote one will appear double; in both these cases, you will observe three fingers. To enter into an explanation of this fact would lead me too far, and does not belong to the question proposed.

Physiologists have adduced a multitude of theories and modes of explanation of these questions. It has been asserted (and by Gall originally) that in seeing we use only one of the eyes at a time, and never both in conjunction; at one time the solution of the question has been found merely in the decussation of the optic nerves (*chiasma nervorum opticorum*); at another time again habit has been assigned as affording an explanation of the difficulty.—But, to reply severally to these assertions; man, being endowed with two eyes, is not a Cyclops; the operation of the mind in its

functions of perception does not admit of explanation by the laws which govern matter; neither can it be said that habit is born with us.—Since subjective seeing in a perfect sense of sight consists in the formation of a correct idea from visual sensation, that is to say, in an accurate perception of the object, these theories appear to me somewhat too partial, and not sufficiently physiological, and I think, therefore, that the present solution of the question comes nearest to the fact.

CHAPTER III.

IMPORTANCE AND DIGNITY OF THE EYE; AND ITS PRE-EMINENCE ABOVE THE OTHER ORGANS OF SENSE.

§ 1. *Comparison of the sense of Sight with the other senses.*

It will not be difficult for us to determine what rank in the order of the senses is to be assigned to that of sight, when we have first taken a brief view of all the senses with regard to the purposes they are intended to fulfil.

The sense of touch is exercised upon the mechanical relations of bodies; and serves for the perception of weight, form, and the position of bodies with respect to each other.

The sense of taste is adapted to chemical relations; and receives impressions from fluids, or substances in the state of solution.

The sense of smell is likewise adapted to chemical relations; but for the perception of substances in the aeriform state.

The sense of hearing is designed for the perception of sound, and its modifications, tones, which are produced by the internal vibration and motion

of the particles of bodies, and which are rendered perceptible to the ear through the medium of the air.

The sense of sight is adapted to light, and its modifications, colour and shade ; and, besides, to the perception of the surface, form, and position of objects, through the medium of light. The two latter senses are accordingly adapted neither to mechanical nor chemical, but only to the dynamic relations of the external world, which depend upon the mere extension of the primary cause.*

* The difference of the senses depends not merely upon the peculiar mechanism of each of the organs of sense, by means of which each organ is individually adapted to those qualities of objects in the external world from which it receives impressions, but depends no less upon the peculiar kind of sensation excited in each of the proper nerves of sense, which is different in each of those nerves. Thus the sensation of light belongs exclusively to the optic nerve, that of sound to the nerve of hearing, and so forth ; the optic nerve being no more capable of perceiving sound than the nerve of hearing is of perceiving light. This property, inherent in the nerve of each sense, and different in each, corresponds to the nature of the sense, and is named its *energy*. The excitement of this energy constitutes the sensation of the nerve, which may be different indeed in degree, but is always of the same nature ; as for instance, the differences of *tone* perceived by the nerve of hearing are all relations of *sound*—as has been already shown more fully at page 31, in treating of pure visual sensation. That this peculiar property is different in each of the nerves of the senses is evident from the fact, that the same cause produces a different sensation in the different senses, viz. that sensation which corresponds to the energy of each sense. The optic nerve, for example, perceives only the light, and the nerves of feeling perceive only the warmth, of the rays of the sun. The vibration of a tense chord is felt by the nerve of touch as a rapid

The three first-named senses, destined for mechanical and chemical relations, are subservient to the purposes of feeling, nutrition, and respiration, consequently, to animal life; the two latter, destined for dynamic relations, render no service to the functions of animal life, but minister only to the soul. The first two or lower senses are excited to action by direct and material contact; the two latter, or higher senses, on the contrary, by an indirect impression from a distance. The sense of smell has these points in common with the two lower senses, that it belongs to a determinate function of animal life, viz. to that of respiration, and that it acts through material contact; but it approaches to the two higher senses in this point, that it is capable of being affected at a distance. This sense therefore unites the inferior with the higher senses, and stands as it were between them, being connected on the one hand with the two

succession of slight strokes, by the nerve of hearing it is perceived as tone, and by the optic nerve as a silent tremulous motion. Inflammation produces in the eye an appearance of light; in the ear, a sort of buzzing or singing; and in the nerves of feeling, pain. When the eyes are placed in communication with the electric fluid, the appearance of a flash of light is occasioned in the optic nerve, in the dark; if the ear be made the subject of the experiment, a hissing or crackling noise is produced in the nerve of hearing; in like manner, an odour of phosphorus is produced in that of smell; in that of taste, an alkaline or acid flavour, according to the kind of electricity; and in the nerves of feeling, a sensation of a blow, or shock. (VOLTA, A. VON HUMBOLDT, T. MUELLER, RITTER.)

senses which are subservient to animal life, and on the other hand with the two which minister to the soul. But now if seeing be a mental touching at a distance, through the medium of the eye, and by the help of the rays of light, as we have observed at page 28, the sense of sight borders on the sense of touch, and thus a circle is completed by the series of the five senses.

Hearing and sight, as the principal means by which external objects are perceived and recognised, are the senses employed upon the two objects which form the groundwork of all human knowledge, viz. time and space.

Sound, or the internal vibration and motion of the particles of bodies, and tones, are the messengers which convey intelligence of the intimate nature of bodies, viz. as to their solidity and comparative density; just as language is the messenger which informs us of the character and inward workings of the mind. The internal ear, retired within the deep recess of the bone in which it is quietly and securely lodged, hears those vibrations and motions, and hears also the language of the lips. Light discloses to our view the appearances of the material world; and as colours, with all their variety of shade, form the garment in which these phenomena are arrayed, so is the embodied word, or written language, the garment in which the thoughts and active operations of the mind are presented to us. The eye, not retired within its

recess, but openly turned towards the external world, and endowed with the power of free motion, perceives those phenomena, and perceives the written language. The ear therefore is adapted to terrestrial objects only, for the sound which we hear belongs exclusively to the earth; while the eye, on the contrary, is applicable to the whole system of the universe, since even the most distant bodies of this system send at least an intimation of their existence to the eye. The former leads us, by the "concord of sweet sounds," to the still world of our own heart; the latter draws our mind outwards to the contemplation of the wondrous magnificence of Nature, whose mysteries we explore by means of the eye. The ear is accordingly the sense for the passions and feelings, the eye the sense for the understanding. To conclude this comparison, let us turn to the Mosaic account of the creation, where we shall find it recorded, that a deep stillness and repose, and a mysterious darkness hovered over the chaos of things, and God commenced his work by saying,—Let there be light,—and there was light. The sublime volume of revelation declares again, that when the trumpet on the last day shall announce the judgment of the world, then, amidst the noise and tumult of the elements, shall the sun, moon, stars, and all temporal things perish, but the spirit of man shall enter into the bright and resplendent mansions of eternity. Sound, dependent upon the material

world, will pass away with it; the ear is consequently for the Finite: light, on the contrary, with which the creation of the world began, will continue to exist hereafter; the eye is consequently for the Infinite.

As a summary of what has been stated with respect to these two senses, I present the following view of the comparison:

The sense of hearing is adapted to	The sense of sight is adapted to
Sound	Light
Tones	Colours
Matter	Form
Quality	Quantity
Centre	Circumference
Rest and Motion in Time	Rest and Motion in Space
Speech	Written Language
The Feelings	The Understanding
The Finite and Temporal	The Infinite and Eternal

From the foregoing comparison of the senses with each other, we see that they are all instruments for the purpose of enabling the mind to receive impressions from the external world, and therefore, with reference to the mode in which this is effected, the sense of touch may be called a mechanical sense, those of taste and smell chemical, and those of hearing and sight dynamic senses. Thus keeping in view the purposes for which they are intended, the five senses may be arranged in a progressive series, which begins with the sense of

touch as the lowest, each succeeding sense presenting nobler characters, till the series is terminated by the sense of sight. Throughout the whole range of Nature, it is observable that every created being is constituted with relation to the element in which it lives;—the nobler the element, the nobler the creature that inhabits it. Now as light, belonging to the class of imponderable substances, is a highly subtile matter, and is the proper element for the eye,—for this organ is developed in, lives by, and is destined for light—the sense of sight is most justly entitled to hold the highest rank among the senses; the sense of hearing, which perceives sound through the medium of the air, which is a less subtile material, as well as the three other senses destined for gross and material substances, being certainly inferior to it.

The senses are a distinguishing attribute of animal life. In man they are all susceptible of equal and simultaneous cultivation. Inferior animals, on the contrary, never possess all the senses developed in equal perfection at the same time, and are therefore inferior to us in this point. In them it frequently happens that one sense enjoys a distinction above the rest, according as it may be necessary to the habits or wants of a species, as for example, the sense of sight in birds.

§ 2. *Language of the Eye.*

Though animals are endowed with the power of making their grosser perceptions intelligible by certain sounds to animals of the same species, yet it is not possible for them to communicate with each other in articulate tones. This incomparable distinction, the gift of speech, is granted to man alone ; he alone speaks of the various appearances of the material world, of his ideas, desires, and feelings, the recondite workings of the mind, and the sublime and eternal attributes of the Deity.

Just as speech is a distinction of man from brute animals, and places him at the head of the whole animal kingdom, so also does the language of the eye claim for this organ the first place among the organs of the senses. No other sense possesses the power of indicating externally the condition and emotions of the inmost soul. The three inferior senses receive and enjoy only ; the ear too hears, but answers not ; the eye, on the contrary, receives with complacency, and replies with love. So grateful is it, that it would gladly, if possible, repay with interest every gift it receives ; the other senses, on the contrary, are mere egotists. The eye drinks in the universe, and reflects a wondrous heaven of thoughts and feelings.

The language of the eye is certainly the tenderest and the most wonderful of all languages,

inasmuch as it conveys a direct intercourse of souls with each other. It is a language which belongs to no place, yet is every where understood ; is nowhere written, yet every where read ; nowhere determined by any fixed rules, yet every where correctly spoken. It is so natural that it is as it were born with us ; so plain, that every child, and even animals understand it ; so simple, that no one has occasion to learn it. Every one knows, speaks, and understands it. It is more eloquent, more deeply impresses the heart, and is more perfectly and quickly understood, than even the articulate accents of the lips. In the eye the soul itself expresses directly what the mouth seeks only to convey through the medium of sound and tones. The mouth is only a tedious interpreter, a circumstantial analyst and prolix expounder of that which the eye indicates more rapidly, more perfectly, and as sensibly as a delicate thermometer. For this reason it is, that we quite unconsciously direct our glance not to the mouth but to the eyes of the speaker, because the eye is the only portal at which souls meet, where they either lovingly embrace, or fly repulsed from each other. When conversing even with a man who is blind, we cannot refrain from looking towards his eyes ; and although we find them destroyed and their light extinguished, we still feel ourselves constrained to fix our glance upon the spot from whence the soul would otherwise beam towards us.

The eyes then are true telegraphs of the soul, which indicate the still flame of love, the angry glow of hatred, the heaven of innocence, and the hell of vice; and whatever moves and works within the human breast, divinely, humanly, brutally, or diabolically, all is distinctly expressed by the universal language of the eye.

When we make any observations upon the mien of an individual, and say, such a person looks so and so,—cheerful or morose, for instance,—we mean that he allows this or that definite condition to appear in his eyes—his eye expresses a cheerful or morose disposition. Men of business, when they part, wish to *speak* with each other again, and accordingly say:—I will *speak* to you to-morrow on this subject; friends and lovers, on the contrary, think only of *seeing* each other again, and say:—I shall see you to-morrow, (*Au revoir—A rivederci—Auf Wiedersehen.*)—Why do not lovers think equally of speaking with each other again? Because the language of words is far too poor to express the feelings they read in each other's eyes; because their souls wish to meet again in that heaven where they first became acquainted, and where they first welcomed the smile of dawning love.

Tears may be mentioned with propriety in this place, as forming a part of the language of the eyes. They are the signs of inward emotion, the expression of the highest joy or of the deepest

sorrow; the salutary crisis for the relief of the feelings.

§ 3. *Power of the glance.*

It is in the glance that the strength and dignity of the soul are most powerfully and vividly expressed. The glance darting from the eye reaches to a considerable distance, strikes upon the minds of the beholders like a flash of lightning, and the person upon whom it falls feels himself as it were under the influence of fascination. It is an arrow which often deeply wounds; but like the weapon with which Telephus was wounded, it has power to heal the wound it has inflicted. Wherever superstition has reigned, peculiar and incredible powers have been ascribed to the glance; who has not heard, for example, of the error which prevailed in early times as to persons being bewitched by the glance? and even at the present day the common people in Italy (who speak of *l'occhio cattivo*,) and some of the Indian tribes also believe that the look has the power of producing evils and diseases of various kinds. But it is not to be denied, that persons endowed with superior powers of mind and firmness of character exercise by their glance a truly commanding sway over the circle which surrounds them. The glance of such persons strikes the orator dumb in the midst of his

harangue, arrests the enterprises of men, and checks them in their actions. By this power the hero has not unfrequently conquered his furious enemy and the opposing band of warriors.

“Upon the crowd he cast a furious look,
And withered all their strength.”

DRYDEN.

There are persons, moreover, whose firm glance animals regard with fear; before which the angry mastiff cringes, the wild bull slackens his speed, and even the ferocious lion and tiger are held in awe.* That horses are broken in by the look is a fact not unknown.

* Van Aken, who possessed the art of taming wild animals, effected much in the exercise of this art by his glance. When he entered the den of the lion, he immediately arrested the eyes of the animal by a powerful and firm glance, which he kept fixed upon him, and never averted so long as he remained in the den. Those who have witnessed the performances of Van Amburgh with his various wild beasts at our theatres, may have observed that he also when in the den always fixed his eyes firmly on those of the animal with which he was more immediately occupied. After having myself closely viewed his performances several times, I had some conversation with him on the subject, when, in confirmation of what has been already stated, he admitted that much was effected by the look in rendering wild animals subject to the will and control of man. While conversing with Van Amburgh, I could not but notice the remarkable appearance of his eyes, which seemed to me particularly well qualified for this purpose. They are very large and prominent, and their glance extremely keen, firm, and powerful.

§ 4. *The Eye in relation to the countenance.*

Beneath the arch of the pensive forehead, between the tranquil temples and the ever watchful ears, above the cheeks where plays the smile, and the mouth whence flows the stream of eloquence, the eyes, separated by the gentle elevation of the nose, have taken up their abode. Thus even locally advanced and elevated above the rest of the senses, they are enthroned on the front and towards the highest part of the head, from whence they can most readily and easily command the objects of their immediate neighbourhood, guide their owner on his way, and contemplate the glorious system of the universe. Man is therefore designed to direct his look upwards, or towards heaven.* Although the look penetrates and embraces an immense space, the eye remains modestly in its recess, overshadowed by the lofty forehead and surrounded by gentle eminences,—an altar in the holy temple of thought, on which the soul offers sacrifice. Our look, when it falls upon the human countenance, glances off as it were from these eminences, and is thus conducted into the interior of the temple. It is therefore by no

* The Greeks accordingly named man *ἄνθρωπος*, (from *ανω*, upwards, *τρέπειω*, to turn, and *ὤψ*, the eye) the upward looking.

means the free motion or the lustre of the eye which attracts us ; it is the soul itself which exercises this magic power over us through the eye.

All the parts of the face may be regarded as mere hieroglyphics, which we are not able to understand, unless the eye perfectly interpret their meaning ; for all the traits and lineaments of beauty that are scattered over the face collect in the eye, concentrated, as it were, into their focus, from whence they are again diffused with heightened lustre over the whole countenance. Whatever importance one may seek to give himself by mien and gesture,—so far from impressing other persons with an idea of his consequence, he will only appear ridiculous, if the eye give no indication of dignity of soul. However quietly the features may be composed,—true calmness of soul is expressed only by the eye. Let a man appear ever so sincere,—if he be not really so, the faithful eye will give its testimony against the deceit. We may force ourselves to laughter,—but it will be mere grimace and distortion of features, if the soul smile not at the same time through the eye. However nobly the forehead may be arched,—the expression of thoughtfulness is imparted to it mainly by the eye. How beautifully soever the mouth and the rest of the features may be formed,—still it is the eye which lends them their charm and sweetness. However eloquent the lips,—it is by the holy light which beams from his eye, that the

preacher conveys most impressively the sacred truths which he inculcates.

In the expression of pain and sorrow there is a concentration of the features towards the eyes; in that of joy, on the contrary, an expansion of the features from the eyes takes place. In the expression of love, the whole face is dilated in a direction parallel to the eyes; in hatred, on the contrary, the face contracts more towards the medial line, so that furrows are formed in the forehead which cross the direction of the eyes perpendicularly. The eyes then are the central point of expression in the countenance; thus Buffon observes: "S'il est vrai, que la face humaine soit un tableau, où viennent se peindre les sentiments doux et tumultueux, les passions orageuse ou le calme de l'âme, c'est l'œil, qui en forme le trait le plus saillant et le plus essentiel."

As the eye of heaven, the sun, sheds a bright effulgence over the firmament, and animates all nature, diffusing splendour and majesty over mountain and valley, flood and field; so does the master-organ of creation, the eye, animate, exalt, enlighten, and shed lustre over the whole human countenance. Where the light of the sun is wanting, nothing can flourish, and all vegetation perishes; so also in those of our fellow-men in whom unhappily this divine structure, the organ of light, is disorganized and destroyed, the beauty and expression of the face in great part disappear,

and in most cases also the full development of animal life is impaired, and the exuberant buoyancy of health is wanting. As during the night the sun withdraws his beneficent influence from that part of the earth which is veiled in darkness, so also during sleep the eye withdraws its exploring glance from the external world; as the veil of night is removed from the face of nature, when the sun re-appears in heaven, so do the eyelids fold back, when in the morning the eye turns again to the external world; when the business of the day is ended, the eye again conceals itself within its sanctuary, which is closed by the eyelids, just as in the evening the sun dips into the ocean, and is concealed by the shades of night. As in the autumn of nature clouds and mists obscure the light of heaven, so at length in the autumn of life the eye veils itself and its neighbourhood in mourning; and in the anxious hour of final separation, it appears lustreless and absorbed in grief, because the soul, that friend with whom it has so long maintained a union so tender and intimate, is about to part from it.

“ Oh ! o’er the eye Death most exerts his might,
And hurls the spirit from her throne of light.”

BYRON.

§ 5. *Form and Nature of the Eye.*

If we divest the surface of a body of all its angles and elevations, entirely removing every

inequality, there will remain to us a sphere. Vapours collect in the air, in the form of clouds more or less rounded; when these empty themselves, they fall as drops of water to the earth, which have likewise the spherical form. If we distend water by means of air, as in the soap-bubble, the same form again presents itself. In the round grain of seed lies the germ of the plant, which finds its highest degree of development and perfection in the rounded fruit, and again in the rounded seeds. The first beginning of animated creation is found in those animalcula, to which the name of *infusoria* has been given, which are homogeneous vesicles of a globular form, the lowest animal at least in the system of these infusoria, the *Monas termo*, being exactly of that form. Every other creature, even man himself, begins by development from the sphere, namely, from the ovum. Ascending upwards from the lowest bodies on our planet to the highest creature, man, Nature in her plastic formations manifests an increasing tendency to the spherical form, which in him she has reached, or very nearly approached, especially in the head, which is more spherical than the heads of other animals. And is not the form of our planet, the earth, and of all the other bodies of the universe, that of the sphere?—Thus we find throughout Nature the presence of the sphere, or of forms approaching to it; it would therefore appear to be the primitive form of every material substance, even

that of the universe itself; on which account a celebrated heathen philosopher, Xenophanes, attributed the spherical form to the Supreme Being.

From our previous inquiries we have learned that the eye is spherical, that it is transparent in order to allow the transmission of the rays of light, and that it may be turned in different directions to receive these rays; so that if the question be now asked, what is the form and nature of the eye?—it may be answered, that its form is moulded according to the primitive form of every created thing, and its nature is that of a creature of light, whose body is crystal, and whose spirit is an emanation from the eternal source of light. It is a creature which is formed for light, is developed under the influence of light, and lives by light; which has taken up its abode in the spherical habitation of the organ of the soul, *i. e.* in the head; and which, lastly, possesses as its fairest attribute a language instinct with soul, a language not of tones, but of vibrating light, which it speaks by means of the motions of the iris, as the mouth utters articulate sounds by the motions of the lips.

The representation of an eye upon a light ground has been employed, as is well known, as a symbol of the Deity. Why now is an eye selected for this purpose, and no other organ of sense, as the ear, for example?—Because the eye, perfect in its form, alone possesses the noblest and the most perfect attributes; because the mental eye of man, which

is visibly represented in his bodily eye, is as it were an emanation from the original fountain of light; and lastly, because, while the bodily eye sees and recognises, the mental eye is knowledge itself. The eye is therefore the noblest and most appropriate symbol of the All-seeing Spirit.

It is a fact worthy of remark, that persons afflicted with amaurosis, whose eyes, though not disorganized or destroyed, have lost the faculty of vision, carry their heads erect as they walk, and seem to look to the far distance, although to them it is veiled in night. The great book of Nature with all its splendour lies as a blank before the eyes of the blind; but a soothing light, cheering and inspiring his heart with hope, beams upon his soul from that realm which lies beyond the grave. Thus Milton, after pathetically lamenting that his eyes, veiled in darkness, rolled in vain to find the sun's piercing ray, and found no dawn, exclaims:—

“ So much the rather thou, celestial Light,
Shine inward, and the mind through all her powers
Irradiate; there plant eyes; all mist from thence
Purge and disperse; that I may see and tell
Of things invisible to mortal sight.”

§ 6. *The Eye a Microcosm.*

Philosophers and physiologists agree in considering man as a microcosm—a world in minia-

ture, in contradistinction to the macrocosm—the world at large.

Each of these constitutes a self-subsisting whole, of its own kind, and as such possesses its own proper powers, and its own proper parts or members. As the parts depend on the whole, so does man depend upon the world, and by this dependency becomes a part of it. But if we leave this dependency out of our view for a moment, then man, as well as the world, stands as a self-subsisting, independent individual. The one corresponds to the other as regards its own individuality, its own proper powers, parts, and dependency of parts on the individual. In this sense therefore man, with the same propriety as the world, may be named a macrocosm.

The parts of the world at large are the sun, planets, &c., and each of these parts is again a world in miniature. Now as we have applied the term macrocosm to man, why should not his noblest and most distinguished part, the eye, be named a *microcosm*?—especially as, with respect to the form and certain other properties, there is a great similarity between the eye and the individual worlds, and several of their phenomena are alike. For this reason some philosophers have already bestowed this name of microcosm upon the eye. Any one of these bodies, our own planet, the earth, for instance, may be named an eye; and the eye therefore may be considered as its counterpart or repetition. A comparison between the eye and

the earth, which is at present the best known to us of the bodies of our system, may serve to demonstrate the truth of this position.

The earth and the eye both approach very near to the spherical form, and also resemble each other in form. The earth has nearly the shape of an orange, being somewhat flattened at the two poles; in the eye the horizontal axis is shorter than the perpendicular, so that it is somewhat flattened in front and behind.* At the two poles of the earth are found two opposite powers, a positive and a negative power; at the posterior point of the horizontal axis of the eye is the seat of the strongest and most acute sensation,—this answers to the positive; the anterior point of this axis on the other hand merely allows the rays of light to pass through it,—and accordingly gives the negative. The earth possesses the power of attraction and repulsion, which also is not wanting to the eye, only in this case it is a mental power. The earth has its electricity; from the eye darts the electric spark. The earth turns round its axis, and performs its revolution also round the sun; the eye has motion round its axis, and likewise round the line of the centre of gravity of the whole

* According to Soemmering and Treviranus this is the case in most animals, the eye approaching most nearly to the spherical form in the monkey and in man, but still not constituting a perfect sphere.

body.* The eye, as a part of man, depends on him, and he again on the world; the earth, as a part of our solar system, depends on its centre, the sun, and this again on a higher power which holds the universe together.

The earth and the eye both consist of transparent and opaque concentric layers of different density. The transparent layers, belonging to the earth, are the atmosphere and water, through which the light of the sun reaches it in order to call forth life in various forms upon its surface; those, on the other hand, which lie beneath its surface, are dense and opaque. In the eye the transparent layers are the different refractive media, through which the light passes in order to paint upon the retina the many-coloured images of life or of the external world; those, on the other hand, which surround these media on its exterior surface are dense and opaque. The difference therefore is only in the position of the layers, the relations remain still the same; for of whatever actually exists on the surface of the earth we have an ideal impression upon the retina of the eye, and that which in the earth forms the centre in the eye goes to form the circumference, and *vice versâ*.

* A perpendicular line drawn centrally through the body of a person standing upright, is called the line of his centre of gravity. If he now stand firm with his feet upon one spot, and then turn the head and body around this line, the eyes describe a semicircle around this line either to the right or left.

I might here point out an analogy with respect to organization also between the earth and the eye ; but as this would lead us too far, I proceed to institute another comparison of this organ, originally suggested by the late Professor Beer, of Vienna, in which we shall find a more striking analogy, and to the justice of which the most eminent physiologists have not refused their assent.

§ 7. *The Eye a Micanthropos.*

As man, in relation to the world at large, is a world in miniature or microcosm, so the eye, in relation to man, is a miniature organism or micanthropos.

The vital power exhibits itself in the animal body as sensibility, irritability, and nutrition. The material parts of the animal body are : 1. the osseous system ; 2. the muscular system ; 3. the vascular system, comprising the arteries, veins, and lymphatics ; 4. the nervous system, including the nerves of sensation, the nerves of motion, and the ganglia ; 5. the various tissues, viz. the cellular and corneous tissues, the membranes, glands, ligaments, tendons, and cartilages ; 6. and lastly, the various fluids.

All these systems, tissues, &c. being interwoven with each other in the animal body, not indeed with perfect regularity, but still with a certain re-

gard to symmetry, compose its various organs and parts, and give it its form, and thus constitute its organization; the sensibility, irritability, and nutrition give life to the organization; and the mind and its self-activity make the organized and living body a conscious and reasoning individual, man.

But in no organ of the human frame does the mind with its various conditions and emotions render itself more perceptible, and even visible; in no organ do the sensibility, irritability, and nutrition manifest themselves more clearly, than in the eye. Nor in any other organ of the body are all the systems, tissues, &c. of the animal organization united in so symmetrical and so regular a manner, as in the admirable structure of the eye, inasmuch as one system is here always joined concentrically to another.

In the eye the brain flowers as it were and unfolds its blossom, the nervous system being expanded into the delicate retina; to this the vascular system joins itself as the choroid coat; this again is inclosed by a membrane of the fibrous system, the sclerotica; to this the muscular system is added in the most beautiful order; and the whole is surrounded by the osseous system, the walls of the orbit.* The cellular structure is found in the vitreous body, and cellular tissue is the medium

* In man the orbit is more amply encircled by bone than in any other animal.

by which the various membranes of the eye are united. A serous membrane lines the two chambers of the eye, and envelopes the iris in the same manner as the membrane, called the pleura, surrounds the lungs. The name of the cornea indicates at once to what tissue it belongs. Humours differing from each other are found in the chambers of the eye, in the lenticular system, and in the cells of the vitreous body. The eye possesses, moreover, its proper nerve of sense, nerves of sensation, of motion, and ganglionic nerves; it possesses arteries, veins, and lymphatic vessels; it has the lacrymal and several other glands, *e.g.* the *caruncula lacrymalis*, &c. The conjunctiva, which covers the inner surface of the eyelids and that portion of the anterior part of the eyeball which is seen from without, is a continuation of the common skin, which here assumes the nature of a mucous membrane. Within the eyelids we find cartilage, and even hair is not wanting, to bring the external form of the eye into perfect accordance with the general idea of harmony and beauty.

This intimate union of all the systems and tissues of the human body in the eye, the manifestation of the sensibility, irritability, and nutrition, and the portraiture of the mind and its emotions which it reflects, render this organ accordingly a true *micanthropos*. And as the utmost regularity of arrangement of all the systems and tissues is manifested only in the structure of the eye, it must be

admitted, that nowhere else does the plastic power of Nature afford greater evidence of design in the formation of an organized and living body, and of perfection in the accomplishment of that design.

The transparent eye is a beautiful emblem of the bright and glorious tenement, which will hereafter form the abode of the immortal spirit of man, when it has left its tenement of clay.

CHAPTER IV.

EXPRESSION OF THE EYE AS INDICATIVE OF CHARACTER.*

Though hitherto chiefly occupied in demonstrating that the mind receives impressions from the external world through the organ of sight, I have

* Let me beg permission to remark in passing, that according to my view of the subject, it is only from a thorough and diligent study of the characteristic expression of the eye, combined with the study of the features of the face and of the general form of the skull, that a science could be framed which might justly merit the name of Physiognomy. In the prosecution of this study it would be necessary, commencing with the glance of the eye, to compare critically the results of such investigations, paying attention at the same time to the tone of the voice and way of speaking, and to the habitual carriage of the body, and then to deduce and establish certain fundamental rules. In this manner only can we hope to succeed in founding a rational system of Physiognomy, which will have more practical value than the Phrenology now so much in vogue, because the essential character of man (*essentia hominis*) is to be recognised in his entire appearance and demeanour, and is chiefly to be read in that fair mirror of the soul, the eye; the study moreover will be rendered much more agreeable, inasmuch as it will no longer be necessary to examine by the touch, but merely with the eye.

Hitherto in scientific labours of this nature the subject has not been grasped in its full extent, too much importance having been attached to individual parts, and rules and principles have been laid down which were derived sometimes merely from the form of the skull, and sometimes only from the features of the

already on more than one occasion observed, that the transparent eye is at the same time an organ through which the mind is reflected from within. In the eye the individuality of man, the character of his mind, the state of his feelings, the affections, and passions make themselves perceptible. Whatever works mysteriously within the mind, whatever stirs within the inmost heart of man, for which

face. Far be it from us to pass any censure upon the great and immortal Lavater's incomparable work—his *Physiognomy*, yet every reader of that work will soon observe that Lavater treats of the moral and intellectual character, as plastically expressed chiefly in the face, and that he makes merely a few passing remarks upon the indicative character of the eye. Goethe, who was personally acquainted with Lavater, speaks of him, in conversation with Eckermann, in the following manner (See Joh. Peter Eckermann's *Gespräche mit Goethe*. Leipz. 1836. Pt. 2. p. 70): “Lavater believed in Cagliostro and his miracles, and when the latter had been unmasked and exposed as a deceiver, he affirmed that this was another Cagliostro, and that the Cagliostro who performed the miracles was a holy person. Lavater was a really good man, but he was credulous and liable to be greatly imposed upon; he was not sufficiently strict in the investigation of truth, and deceived himself and others. A complete rupture on this account occurred between him and myself.” On Eckermann's inquiring whether Lavater had a taste for the study of the phenomena of nature, as might almost be concluded from his work on *Physiognomy*: “Certainly not,” replied Goethe, “the bias of his mind was merely to the moral and religious. That which is met with in his *Physiognomy* on the skulls of animals was furnished by me.” Concerning Gall, G. Christoph. Lichtenberg (in his *Miscellaneous Writings*, Vol. III. p. 508.) thus expresses himself: “Of the external form of the head, the abode of a free agent, we must not presume to speak, as if it were a gourd; nor can we pretend to calculate the conditions dependent upon it, as we do the eclipses of the sun.”

ofttimes no words of utterance are found, all is unfolded and reflected in the eye; justly, therefore, has it been named the mirror of the soul.

It is this property, then, this fair attribute of the eye, into which we are now about to inquire. In the consideration of this subject, we shall have to direct our attention to the immediate neighbourhood of the eye, to the motions of the eyeball, to the changes and appearances which present themselves in the eyeball, and lastly and more especially, to the look itself. But now as the look presents such infinite variety, it will be necessary to investigate previously the principal conditions upon which this variety depends, and to lay down some general rules respecting the look.

The particular character of the look is determined partly by the motion of the eyes, and partly by the axis of vision. The various motions of the eyes, taken by themselves, however, impart to the look merely something of an inferior character, belonging to our animal nature; the higher, more expressive, and intellectual character, on the other hand, is conferred upon it by the direction which the axes of vision assume. The axis of vision is a horizontal line passing centrally through the pupil and globe of the eye. If we imagine this line to be continued forwards from each eye, the two lines either run straight forward at an equal distance from each other, which is named *the parallelism* of the axes of vision; or they converge to-

wards each other, and then meet together at a certain distance in front of the eyes; the point at which they cross is named *the point of convergence* of the axes of vision. This convergence may, after some practice, be easily observed by paying close attention to the direction which the eyeballs and pupils assume towards each other, when viewing an object. I shall now first speak of the direction of the axes of vision.

An almost perfect parallelism of the axes of vision is observed in that look which is entirely void of mental expression, but in an expressive look the axes of vision always converge more or less. The degree of convergence of the axes will therefore serve as a basis for three distinct differences which we have to notice in the look, as determined by the axes of vision only; thus the point of convergence either exactly *coincides with the object* looked at, or *falls short of it*, or, lastly, *lies beyond it*. The *sensual* look has its point of convergence always before the object, and if this point lie very near to the eyes, the look is fixed, or rigid, and in many cases the eyes may even seem to squint. The *contemplative* look has its point of convergence at different distances behind the object. When this point lies at a fixed and determinate spot behind the object, the eyes appear to look through the object, as it were, and the look thus becomes what is termed open, and reflective. This kind of look seeks to comprehend

the object in its entire appearance, and not merely some particular part of it; hence arises what may be termed contemplative seeing* (*contemplari*), whereby abstract contemplation is manifested. In the *intelligent* look the point of convergence coincides exactly with the object. When it rests upon the object, the look becomes keen, investigating. This kind of look regards the different parts of the object, and not so much its ensemble; hence arises what may be termed intelligent or attentive seeing (*cernere*), and as from the exact coincidence of this point with the object arises the most distinct vision (the sight not being so good where there is not such coincidence), this seeing at the same time corresponds with what we should term sharp-sightedness (*acies oculorum*).

In the three kinds of look which we have hitherto mentioned, the axes of vision incline steadily to the point where they cross, and the look in these cases might accordingly be termed *steady*, while the following, on the other hand, might be denominated *unsteady*. Under this latter term is to be understood a certain motion of the axes of vision during their convergence, before the situation or relation of the point of convergence to the object is deter-

* This kind of seeing is very well expressed in the following phrase used by the French in speaking of a wife who is fondly attached to her husband, or of a mother who fondly loves her child: "Elle ne le croit pas, où elle le voit; elle ne le voit pas, où il est."

mined. When they have reached and taken up this position, the motion either ceases, and they then remain at rest; or the motion of the axes of vision continues even after the point of convergence is determined. In the first case, the look might be named fluctuating, or flickering; in the second, it might be termed penetrating or piercing. Sometimes the fluctuating look denotes a predominance of the feelings, while the penetrating look indicates a preponderance of the power of the will, or energy of action.

Secondly, the look is determined partly by the motions of the eyeball, as has been already mentioned, and in this there are three points to be attended to, viz.: 1. whether the motion is accomplished with difficulty, or with ease and decision; 2. whether it extends itself over a large or narrow field of view; 3. whether it is performed in a straight or in a curved direction, while the eye is passing from one object to another. When the eye performs its motion heavily, within a limited field, and passes in straight lines from one object to another, the look has always something unpleasing and repulsive to the observer. When, on the contrary, the eye moves with ease and freedom, taking in a large field of view, and passing from one object to another with a curved motion, the look has always something pleasing and attractive. Porta, speaking of that kind of look, in which the eye moves with a freedom

which delights the beholder, thus expresses himself; “*gli occhi si movano come l'acqua nel vaso.*”

Now as the character of an expressive look does not result merely from the convergence of the axes of vision, nor from the motions of the eyeball, taken separately, but from the combination of both causes, inasmuch as they must always occur together in the eye, it is evident that by the different degrees and kinds of the convergence, by the various modes of motion of the eyeball, by the union of these conditions with, and by their transitions into each other, a great variety of expression must be occasioned in the look. But this variety is still further multiplied, and becomes almost infinite, by the changes which occur in the iris and cornea during emotions of the mind. The iris, for instance, may be more or less tense and turgescient, and the aqueous humour may be secreted in the chambers of the eye in a greater or less quantity; in accordance with which the convexity of the cornea and the degree of moisture of its external surface, caused by the transpiration of the aqueous humour, must be altered.

We know, from observations already made (p. 24), that some light is reflected from the cornea and iris;—now as the reflection of light depends upon the nature of the surface on which its rays impinge, and the nature, or condition of the iris and cornea is varied, as stated above, the degree and kind of the light reflected from the eye must be different under

different emotions of the mind, according as they are of a depressing or exciting kind. The ordinary lustre of the eye is accordingly either impaired, assuming a dull and death-like aspect, or so high a degree of brilliancy and animation is imparted to the eye, that it becomes, as is truly said, sparkling. The lustre of the white of the eye has always something cold or sharp; warmth, animation, and brilliancy are imparted to the glance by that light only which is reflected from the cornea and iris. The colour also of the iris gives a difference of aspect to the eye: the darker the iris, the more fire is there in the glance; the lighter its colour, the milder is the look. Mr. Lawrence* observes, that "a considerable degree of interest attaches to the iris physiognomically, from its brilliancy, its various tints, and the animation it imparts to the countenance."

The eyelids, both in their repose and their various motions, and more especially the shadow, which falls upon the eyeball from the edge of the upper lid and its lashes, have an influence by no means inconsiderable upon the look. A shadow falling deeper, or covering an unusually large surface of the cornea, always gives to the eye an expression of softness. Such shadow may be occasioned either by the head habitually bending forward, the eyeball still remaining horizontally

* Treatise on the Diseases of the Eye, p. 20. London, 1833.

poised,—or, where the head itself is carried erect, by the upper eyelid actually drooping, tremulously or steadily, down upon the cornea. The lower lid on the other hand is sometimes drawn upwards, by which a certain charm or attractiveness is imparted to the eye.* We cannot, strictly speaking, say that the eyebrows give expression to the look, but should rather say they partake of its particular character, whatever it may be.

From what has hitherto been said it is evident that the expression of the eye rests upon certain fundamental rules, but it will be apparent at the same time, that it requires much practice on the part of the observer to understand how to apply these rules to the living eye. To this must be added, that the state of health, the constitution, temperament, age, physical and moral education, intellectual cultivation, near-sightedness and far-sightedness, and even the occupation of the individual, have an influence upon the expression of the eye, so that all this must be kept in view by the observer. In the following brief view of the

* This drawing upward, or raising of the lower lid, and the shadowing occasioned by the upper, as well as the non-coincidence of the point of convergence with the object, are the actual signs, which the ancients appeared to understand under the term *βλέμμα ὑγρόν* so often used by them. If the look has its point of convergence before the object, the epithet *ὑγρόν* denotes sensual passion ; but if this point lie behind the object, the term rather indicates moral love.

subject, therefore, I can only point out a few of the outward signs which this organ exhibits, of the inward mysterious condition and workings of the mind, in order to assist the attentive and acute observer in the farther study of the living eye. I have set down these indications as they are observed at the time when the several conditions of the mind are most strongly developed, and accordingly manifest themselves in the most marked and striking manner in the eye; yet here also the changes which are continually operating must be borne in mind.

SECTION I.—*Expression of the Eye with reference to the Quality and Conditions of the Mind.*

§ 1. Indication of the Innate Constitution of the Mind.

There is in every individual either an absolute *plus* or *minus* in the powers of understanding, feeling, and volition; or there is a relative predominance of one, or two of these faculties over the other, by which an individual is ordinarily governed. All this may be discerned in the eye.

The eye of the man, in whom *the understanding* ordinarily predominates, moves calmly, firmly, passing in curves, through a field of moderate extent, from one object to another. The

look is pleasing, steady, intelligent, or even keen. The pupil is somewhat contracted, or only of moderate size; the iris in a state of tension. The eye has less lustre, which is, however, increased from time to time, and is then particularly apparent upon the cornea. The eyelids are sometimes drawn back more than usual, so that the eyeball appears more prominent; their motions seem carefully measured. The eyebrows are rather bent down, and not unfrequently somewhat corrugated.

The eye of the man, in whom *the feelings* predominate, performs its motions easily but somewhat more slowly, within a larger field of view, and in a curve, the convexity of which is more frequently turned upwards than downwards. The look inclines to fixation, but is pleasing, contemplative, or even reflective, and steady; sometimes however it is fluctuating, flickering, indicating the inward workings and emotions of the mind. The pupil is dilated, the iris appears soft, and bathed as it were in the fluid of the chambers of the eye. A gentle warmth diffuses itself over the sclerotica, which is commonly of a blueish-white colour, and an undulating fire spreads over the cornea. The upper lid droops, and veils the orb more than usual, and has often a vibrating motion, the shadows arising from which impart softness and a tinge of pensive sadness to the eye. An expression of melancholy surrounds the brows and lids,

which move freely and gently. The look of such persons loves to dwell on the distant and ideal.

The eye of the man, in whom *the will* predominates, has great freedom of motion in all its parts, which manifests itself by quick, firm, and for the most part rectilinear motions, within a very large, that is to say, a very wide field of view. In the moments of impatience and excited expectation which so often occur in men of this character, the eyeballs are sometimes found in a state of horizontal oscillation. The look is not pleasing, almost repulsive; it is intelligent, seldom steady, but rather fluctuating, and when fixed becomes piercing, appearing in some degree therefore to offer defiance. There is altogether an expression of self-possession and resolution, which may inspire timid persons with fear. The lids are drawn back; the eyeball actually projects in some degree. The pupil is rather contracted than dilated, the iris tense and turgescient, and moves with more elasticity. The sclerotica, traversed at the sides by vessels that are clearly visible, has a keen lustre; the cornea flashes with fire. The eyebrows appear stretched, the eyelashes are curved more outwards.

In the eye of men of *talent*, and *creative genius*, the expression seems to be a mixture of that manifested under the three former characters. The motions of the eye are easy, free, firm, curved, unfettered, embracing an extensive field of

view. The look is pleasing, attractive, either intelligent or contemplative, open, thoughtful, penetrating. In the aspect of the whole eye is visibly portrayed elevation of understanding, depth of feeling, and mental power, which forces from us an involuntary acknowledgment of respect for the intellectual accomplishments of such men.—Greatness of mind is plainly legible in the eyes of those who have acquired celebrity amongst men by their superior talents. Still do I feel pleasure in recalling to mind the attractive expression of Goethe's brilliant and penetrating eye, which seemed to embrace the universe in its field of view, and which reflected the glowing thoughts and feelings of his creative mind. Those who have known Lord Byron also must have perceived in his eyes the mysterious depth of his feelings, and the fervour of poetic inspiration. And does not the eye of great philosophers tell us plainly how richly their minds are stored, and does it not even intimate to us the difference in the character of their intellectual pursuits? Again, do we not read in the eye of the truly learned, the comprehensive nature of their knowledge and acquirements? Inquire, in short, of History, whether the truly wise and great who have held sway over mankind have not invariably borne in their eyes evidence of the greatness of their mind; and you will be told that such indication was never wanting, unless tyranny or the discordance of base and unworthy feelings had

interfered. Was not the comprehensive mind of Julius Cæsar indicated by the expression of his eye? Did not the Great Frederick sway all before him by the lightning glance of his eye? And did not the great and enterprising mind of Queen Elizabeth flash forth from her eyes, beaming with all the native energy of her character?—The enthusiasm of poets has been kindled by the magic of the glance, and they have sung of the power which they have felt and owned, in high and noble strains.

The eye in persons of *narrow and limited capacity* moves with difficulty, with apparent labour, in a narrow field of view, and chiefly in straight lines. The axes of vision seem to have only a slight convergence, to border almost upon parallelism; the look is vacant and inexpressive, easily misses what it seeks, and is unable to acquire a firm and definite fixation. The pupil is usually very large, the iris appears almost dry. The sclerotica, which is often of a greyish white colour, and the cornea have but little lustre. The eyelids move but faintly. There is altogether an expression of coldness, insensibility, and objectiveness, so that on beholding such persons we cannot help pitying them, that they should use that beautiful organ, the eye, intended to be a vehicle for the mind, merely as an instrument to see with.

§ 2. Indication of the Habitual Disposition of the Mind.

(a) The MORAL condition arises from reason and the conscience, reaches its maturity in the feelings, and shows itself by reflection in the eye.

Virtue and *Piety*, qualities that descend as it were from heaven into the breast of man, give to the eyebrows, which are a little elevated, a certain expression of willing devotion, while the lids, more widely apart than usual, seem to present an open portal for the entrance of the divine light of religion. This light the large pupil, and the iris not tense, but soft and turgescient, seem to absorb. A soft lustre diffuses itself over the sclerotica, and an almost holy light over the cornea. The motions of the eye are free, firm, unlimited, generally in a curve directed upwards. The look is pleasing, mostly contemplative, and open. In *faith*, the look has its point of convergence at an almost infinite distance. The eye delights in the deep blue of heaven, in the calm and cloudless horizon where no bounded or dazzling images intercept the view. In *fanaticism* and *mysticism*, the point of convergence is also distant; the look however is generally fixed, and acquires something of sadness from the upper lid deeply shading the eyeball, the head being usually bent somewhat forwards. *Theology*, when of that character which, exempt

from superstition, delights to contemplate the attributes of the Supreme Being, and inculcates love towards him as the Creator and Benefactor of the human race, has an infinitely distant point of convergence; the eye is bright and clear, moves firmly, calmly, and harmoniously; the look is therefore contemplative, thoughtful, pleasant and agreeable: when of that character, on the other hand, which, austere and gloomy, dwells chiefly on the terrors of the world to come, or enjoins penances, chastisement, and mortification of the body, it has a far less distant point of convergence; the look is certainly contemplative, but unsteady, fluctuating, even piercing, and rather unpleasant; the eye has a tinge of sadness, and moves as it were clandestinely and surreptitiously.

In *Innocence*, the natural condition of the eyebrows is not changed. The upper lid has a quiet and regular play, with a predominant tendency downwards, the lower lid is in general somewhat elevated. The pupil is clear and large; the iris turgescient, moving very freely; the sclerotica has a soft and high degree of lustre; the cornea a mild fire. The eye moves easily and freely within a moderate field of view, and always in a curve directed downwards; the predominant direction of the eye is also downward. The look is open, charming and attractive, sometimes fluctuating; it indicates unassuming and unpretending modesty.

(b) The IMMORAL condition arises from a dis-

regard of the voice of reason and conscience, whereby a licentiousness, an abuse of the freedom of the will, is occasioned in a greater or less degree, and then becomes discernible in the eye.

Immorality is expressed by indifference and coldness in the eye and its neighbourhood, and at the moment when a favourite inclination is excited, a certain degree of restlessness appears in the eye. The eyebrows are generally knit, the lids less open, the pupil more contracted, the iris less free in its motion. The sclerotica has a dirtyish-grey appearance, is deficient in lustre and softness, and is sometimes rather sharp and dazzling. The motions of the eye are rapid, almost unlimited, more frequently in straight horizontal lines than curved. The look is almost disagreeable, rarely contemplative; the point of convergence most frequently coincides with the object, or falls even short of it, and the eyes often become fixed.

Vice imprints on the eye, in plain and marked characters, sometimes an unbounded sensuality, sometimes the habitual passion, or the vice itself, and not unfrequently the stings inflicted by conscience. The eyebrows and lids are often convulsively distorted; at certain moments when the impulse or passion is excited, the lids are drawn back, so that the eyeball protrudes from them bold and unabashed. The eye throws itself, as it were, quickly and hastily over a wide surface, and in straight lines, from one object to another. The

look is always disagreeable, repulsive, sensual; and seeming to examine single objects, it gains thereby the appearance of attention and observation; on its fixation it becomes sharp, penetrating, piercing. To this may be added, that the dirty-yellowish, cloudy, and darkened sclerotica, on occasions when the passions are excited, acquires a keen lustre, and the cornea emits sudden flashes of fire. The pupil is small; the iris tense, and moves with much elasticity.

§ 3. Indication of the Emotions of the Mind.

(a) AFFECTION is that state in which the mind is conscious of pleasure or uneasiness: it arises under the influence of the understanding, apart from that of the reason, is developed under the operation of the feelings, and thus is reflected in the eye.

Love, mildly beaming and hovering in the eye, imparts a luxuriant animation to its whole appearance, and endows it with a charming freedom of motion. The eyebrows seem to expand themselves towards the temples. The upper lid bends with a gentle and tremulous motion downward, veils the cornea more than usual, and with the help of the eyelashes throws a peculiar shadow, which gives a certain melting warmth to the eye. The eye acquires a captivating expression from the elevation of the lower lid. The iris, softly turgescient, seems

bathed in the aqueous humour, which is more copiously produced; rapture is enthroned in the large pupil, around which flows the shining moisture diffused over the cornea and sclerotica, indicating the inward feelings of delight. The motions of the eye are easy, free, embracing a large field of view, and in a curve; but in a higher degree of this affection they are quite unfettered. The look is always agreeable and attractive. In sensual love, the point of convergence always falls short of the object; in the moral or nobler love, on the contrary, it is always more distant, and beyond it. In the latter kind of love, the look is contemplative, open, fluctuating; and, when this is united with the unfettered play of the eyes, they appear intoxicated, as it were, with love, and express an effort to concentrate themselves upon the object of affection, and to embrace it entirely under one view. When the glances of two lovers thus meet, they appear to understand each other, while their eyes communicate their mutual feelings.

Unsuccessful love gives an expression of mournfulness and deep grief to the whole eye, which retires as it were within itself suffused with tears, which it is in fact much disposed to shed. The eyebrows appear corrugated, and the upper lids droop somewhat, moving slowly, and giving the eyes a shade of melancholy; the elevation of the lower lids mostly disappears. The eyelashes bend downwards, as if mourning for the sorrows of

the heart. The iris is relaxed, the pupil moderately dilated. A very peculiar softness and warmth is discernible in the almost watery lustre of the cornea and sclerotica. The motions of the eye are slow, measured, confined within a narrow field, and curved. The look is not unpleasant, but shy, has rather a distant point of convergence, and is accordingly for the most part contemplative, often unsteady, and while indefinitely fixing itself in idea upon the object of affection, appears piercing.

Hatred draws the eyebrows and eyelids more towards the medial line of the face, so that vertical wrinkles are produced in the forehead between the eyebrows. The aqueous humour of the chambers of the eye expands the cornea, the iris is turgescient, the pupil large. Fire flashes from the cornea, and a high degree of lustre is diffused over the sclerotica. The motions of the eye are quick, encompassing a very wide field, and almost always in straight horizontal lines. The point of convergence generally coincides with the object. The look is repulsive, pursuing, fixing, and piercing the object of hatred.

Joy imparts to the eye and its surrounding parts a peculiar freedom and elasticity of motion, while the eyebrows, and the lids especially, play freely and agreeably, and the eyes seem to smile complacently. The iris is tense, turgescient; the pupil dilated; the aqueous humour distends the cornea, gives it a high and animated lustre, which diffuses

itself over the sclerotica. The eye performs its motions within a large space, easily, quickly, either in curves, or unfettered on every side. The look is attractive, open, contemplative, sometimes fluctuating, flickering, appearing from the unfettered play of the eye to revel with delight, and embracing infinitude as it were within its view.—True inward joy is always attended with an agreeable smile, a laughing of the mind, especially visible in the eye. But the more the whole face and the parts surrounding the eye laugh, the less does the mind participate in that laughter. In forced and pretended laughter, the face laughs, but not the eye. In the smile of irony the eyes are fixed, but when the mind smiles in the eye, there is no fixation.

Sorrow causes the parts surrounding the eye to be rather contracted or concentrated. The calm, sunken upper lid, and the drooping eyelashes throw a peculiar soft shadow upon the eyeball. The cornea appears clouded; the sclerotica dull; the iris loose, as if dry; the pupil small. The eye moves within narrow limits, heavily, as if fatigued, and in curved lines. The look has its point of convergence generally before the object, is fluctuating, melancholy, but not unpleasant; it indicates the sufferings of the mind, which in tranquil moments finds relief in tears.

Hope elevates the eyebrows, and opens the eyelids more than usual. The iris is soft, turgid-

cent, tense ; the pupil large ; the lustre of the eyeball mild, though increased in degree. The motions of the eye are easy, free, performed within a large space, and curved. The look is agreeable, contemplative, expressive of a wish which is felt.

Despair wrinkles the eyebrows, and draws the lids convulsively together. The eye is drawn back in the socket ; the iris tense, dry ; the pupil small ; the cornea has a tremulous lustre, that of the sclerotica is slight and faint. The eye moves as if oppressed, yet tolerably quick, within a somewhat limited field of view, rather sideways and in straight lines. The look has its point of convergence generally before the object, is sometimes fixed, repulsive, announcing the internal struggle of the feelings, and the annihilation of all feeling of interest in the affairs of the world.

Fear presents the eyebrows and lids in a state of convulsive distortion. The iris appears dry, tense, oscillating from time to time, the pupil accordingly varying in appearance, but always rather contracted. The lustre of the eye is faint, yet frequently flashes brightly from the cornea. The motions of the eye are hasty, within narrow limits, and in a straight horizontal direction sideways. The look has the point of convergence coinciding with the object, and is at the first moment arrested—even paralysed ; it then becomes restless, and thus appears unpleasant, confused, indicating anxiety and alarm.

(b) *PASSION* is that state of mind in which pleasure or pain is felt in the highest degree : it arises independently of the influence either of the understanding, or of the reason, is developed under impetuous emotions, and thus exhibits itself in the eye.

Terror and *Horror*, when they are suddenly excited, paralyse at the first moment the look and the motions of the eye ; the look therefore appears fixed, but soon becomes restless and confused, at first in constant motion, and flying rapidly from one object to another, then confining itself within more narrow limits, while the whole eye gradually acquires the aspect of fear.

Anger and *Revenge* give restless motion to all the parts of the eye, The eyebrows and lids are convulsively distorted, as if declaring hostility, the lids are drawn back, and the eyeball protrudes from beneath them. The pupil is small ; the iris tense and turgescient ; the cornea expanded by the more copious flow of the humour, and in a state of extreme tension, appearing as if it were about to be rent asunder. Fire flashes from the cornea, seeming to come from the interior of the eye ; the sclerotica has a watery lustre, and is reddened ; the vessels carrying red blood may be clearly distinguished. The motions of the eye are wild, within a horizontal and very widely extended space, sometimes in straight lines, sometimes assuming a circular course which describes a horizontal ellipsis ; the eyeball

then seems to roll in its socket. The eyes in most instances take up the point of convergence before the object, appearing sometimes fixed, as if for a moment paralysed; on some occasions the point of convergence moves backwards and forwards, and the look is then piercing, and has always something disagreeable and repulsive. The angry feeling manifests itself in the eye like a wild demon, which threatens to crush and annihilate every thing before it.

Envy and Jealousy. Although these two conditions of the mind are usually habitual, I have thought it better to notice them in this place. In these conditions the eyebrows and lids are somewhat corrugated, and are less free in their motions. The pupil is moderately dilated, the iris tense, the sclerotica dull, but in certain moments glistening. The eye moves certainly not with ease, but over a space of great breadth, more especially in a horizontal direction, and always in straight lines. The eyes of the jealous person seek, with a kind of restlessness, to fix upon the object of jealousy itself; while, on the other hand, those of the envious person seek to fix rather upon objects that lie at the side, and during such a momentary fixation the point of convergence coincides with the object; the look therefore seems to be intelligent, penetrating, sometimes disagreeable. At the moment when the envious person is inspired with the hope of obtaining some object of his desire, the

eye indicates a wish to command every thing, and therefore looks freely and boldly around ; but when these moments are past, it becomes again shy, or reserved and gloomy, expressing the dissatisfied state of the feelings. Such persons wish to be observed, although their eyes, not being able to endure the glance of others, shrink from the encounter.— It is surprising how similar the look is in two affections of the mind which are almost directly opposed to each other, viz. *envy* and *abhorrence*. The look of censure, rebuke, and disdain, in which the habitual appearance of the eye is altered for the time, has a great resemblance to that of envy, but with this distinction, viz. that in the envious look the motion of the eye is horizontal, while in this look, on the contrary, it is in a perpendicular direction, the glance appearing to measure the object of attention from head to foot.

As every affection may become a passion, I forbear to notice those passions which are only exaggerations of the before-mentioned affections, in order to avoid repetition. When the affection is so violent as to become a passion, the characteristic signs already pointed out appear in a still more striking manner. The exciting passions occasion great mobility in the external appendages of the eye, in the globe itself, in the iris, and in the axes of vision ; the depressing passions have a contrary effect, so that the whole expression of the eye shows plainly that the power of self-

control is for the time overcome. Most of the conditions also, which we have treated of in § 2, as belonging to the habitual disposition of the mind, may be variously modified and heightened by the feelings, and will then exhibit themselves under other aspects. Thus religion may be changed into fanaticism, moral government may be perverted to tyranny, and vicious propensities may lead to abandoned profligacy. In the tyrant, in the robber and murderer, inward discord and tumult, and cruelty of disposition are very legible in the eye, in which the torments of a guilty conscience may be also clearly traced. No dissimulation, or disguise of the inward feelings, has power to change the expression of their look into that of frank cordiality and good-will for any length of time; for the evil principle always resumes ere long the mastery over the good, and proclaims malevolence and wickedness.

In conclusion it may be remarked, that the characteristic expression of the eye, and especially of the look, met with in various animals, is found, and may be pointed out in certain individuals amongst mankind; for example, the expression of cunning and craftiness, observable in the eye of the fox, is met with in men of cunning and artful character, and the silly expression in the eye of the sheep is very frequently found in dull and stupid persons.

SECTION II.—*Expression of the Eye at the Different Periods of Life.*

Like the seasons of spring, summer, autumn, and winter in the natural year, there are in the life of man four periods, in each of which the eye presents a different character and expression according to the general tenor of the feelings peculiar to each of those periods.

In the eye of the child, innocence, sweetness, lightness and gaiety of heart, and freedom from care are portrayed. The eye is very large in comparison with the whole face and its several features. The hair of the eyebrows, which are as yet unwrinkled by any violent impulse or passion, is very fine and short; the eyelashes are long. The eyeball has great lustre, the sclerótica is somewhat transparent, and accordingly rather of a blueish-white colour; the cornea is very convex. The iris has a decided colour, and is softly turgescient; the pupil is large and black, not unfrequently with a slight reddish tint. The motions of the eyeball are irregular. During the first weeks of infancy the axes of vision are parallel; from this parallelism they incline gradually so as to form an infinitely distant point of convergence, and thus the look becomes at length what is called open, and has a sweet and amiable expression. The child at the earliest period is not able to distinguish and recognise

individual objects in the multitude of images that float before his eyes, but merely receives impressions passively from them. The eye easily sheds tears.—In *youth* the eye indicates openness, frankness, ardent glow of feeling, love, desire, and hope. The size of the eye is now more proportioned to the face, the parts immediately connected with it appear free and open. The sclerotica is of a pure white colour, the cornea very convex and very tense; both sclerotica and cornea have a vivid lustre. The iris is of a very decided colour, extremely turgescient, and very sensible to light; the pupil is therefore very variable, yet always endeavouring rather to contract than to dilate itself; it is now of a very deep black. The motions of the eyeball are free, pleasing, and most frequently curved downwards. The look presents great variety, according to the disposition and mental character, which are now more developed; nevertheless the point of convergence assumes a determinate relation to the object. To the free and open look of youth the world is unfolding itself.—In *manhood* the eye expresses independence, seriousness, firmness, energy, and patriotism. The parts adjacent to the eye possess great freedom of motion, which although in great measure governed by the mood of mind and the impulse of the feelings, is yet more under the command of the will. The sclerotica is less white and is often traversed by vessels; the cornea is less convex. The iris loses by degrees

its former extreme turgescence, and its decided colour. The size of the pupil depends rather upon the habitual relation of the point of convergence to the object. With respect to the motions of the eyeball, as also the convergence of the axes of vision at this period of life, no very exact description can be given; since they are variously modified by the temperament, the mental character, and even by the occupation of the individual. The look inclines not only to embrace at once all the different objects in the entire field of view, but also to distinguish minute particulars in their appearance.—In *old age*, the eye gives indication of tranquillity, repose, and experience, and presents symptoms of decay. The long bushy eyebrows are more depressed; the lids loose and drooping. The eyeball becomes somewhat diminished in volume, recedes more into the socket, its lustre is faint and watery, yet the eye is not unfrequently full of expression. The sclerotica has often a dirtyish appearance, and is of a yellowish-grey colour; the cornea is more flattened, and has usually a semi-circle, or sometimes a perfect circle round its margin, of a yellowish or brownish-white colour, forming what is termed the *arcus senilis*, which in extreme old age becomes ossified. The iris appears lax, less elastic, nearly dry; its colour is faded, not equally diffused; the margin of its inner circle becomes rigid in its texture. The pupil is no longer perfectly black and round, but

more of a grey colour, and is generally in the state of dilatation. The eyeball moves with less ease and activity, appearing almost to labour in its motion. The look may be contemplative, reflective, intelligent, or even keen; as a distinguishing mark may be observed a continual effort to place the point of convergence at a greater, and at length at the utmost distance,—a circumstance to which the usual concomitant of old age, far-sightedness, greatly contributes. The look in old age consequently verges towards that state in which it was found during the earliest days of infancy; and as at the time of birth, so is there at the time of death, a perfect parallelism of the axes of vision.

Independently of the eye itself, the eyebrows contribute in no slight degree to give the expression of age to the countenance. In children, and in young persons, they are usually short, fine, soft, and but little prominent; in old persons, on the contrary, they project considerably, are long and bushy. A young person with thick, long, and very prominent eyebrows, may easily be accounted some years older than he really is.

SECTION III.—*Expression of the Eye as influenced by Difference of Sex.*

It is a fact confirmed by daily observation and experience, that while in man the understanding

and the will have the control over the feelings, in woman on the contrary the feelings gain the ascendancy over those faculties—a result depending on the intimate organization of the body and the innate difference of mental character in the two sexes.

The heart is the central point, as it were, of the whole moral existence; all the inclinations and impulses issue from this point as from their root, and all the sensations and feelings tend towards it as to their blossom or point of development. The mind of woman, under the influence of the feelings, has a tendency to be easily and variously affected, and to experience deeper and stronger emotions. This being the case, the least emotion, and the slightest degree of passion must be immediately reflected in her eye; and the more intense the emotion, the more striking and expressive will be this reflection of the feelings. The eye of woman may be regarded as a delicate and sensible thermometer, by which the development of feeling is more readily and plainly indicated than in man. The mind of man, reflecting, planning, and acting, diverts him as it were from the feelings—from the world of the heart—and urges him towards things external to himself. His mind, not so much under the influence of the feelings, is therefore not disposed to be so easily and deeply moved, and only the more violent emotions and passions are reflected in his eye; these are, it is true, definitely portrayed, yet never so highly coloured as in the gentler sex.

In man, when the equanimity of the mind is undisturbed, the eye indicates seriousness, firmness, resolution, and strength of character; in woman it expresses serenity, softness, compliance, and modesty. But when the equanimity of the mind is disturbed, the expression of the eye in woman is far more striking than in man. Neither the understanding nor reason, for example, has power to moderate the haughty, domineering, and fierce expression of the eye in a woman of imperious character, when under the influence of jealousy and anger. Where these feelings are excited to the highest pitch, the Furies seem to revel in the wild and ungovernable motions of the eyes, and in the unbridled and fearful play of their glance. When, on the other hand, rapturous feelings of joy or love have taken possession of the susceptible heart of woman, do not the Graces then appear to hover in the luxuriant fulness, the melting warmth, and animated lustre of the eye; and in the softly varying expression of the glance, do they not seem to wreath the joyous dance with gentle and graceful evolutions? Does not a soft fire beam with swelling and undulating motion from the eye, lighting up and rendering still more bright and lovely, not only its immediate source, but also the whole countenance?

The eye of man has not the power of colouring so vividly the passions; that of woman alone is able to present us with such glowing pictures of heaven or hell.

SECTION IV.—*Expression of the Eye in reference to the Moral and Intellectual Condition of Nations.*

Not only the individual character, and the calm or excited state of the mind and feelings may be recognised in the eye, but the character and condition of a whole nation, or people also, are clearly indicated by the ordinary expression of the eye as observed in the majority of its individuals. This expression announces the prevailing mental character, the standard of morality or immorality, the degree of happiness or misery, of civilization or barbarism, of freedom or slavery.*

* While travelling in a part of Turkey, the following observation forced itself upon me.—The large, open, bright and beautifully formed eye of the inhabitants of the country presents a contrast with the infirm, weak, and rather shy expression of the look. When I looked at them, they turned their eyes away with a motion generally in straight lines, and not unfrequently bent them to the earth, and when they thought they were not observed, directed them again towards me. On my communicating this observation to one of the natives (the interpreter of the Vizier of Belgrade), a man of cultivated mind, who had gained much information by travelling, he answered, that in former times every individual of the Turkish nation, in the consciousness of his physical strength, was bold, and often cruel; he would as readily take away the life of a man, and with as much indifference, as he would “spit on the ground;” but now he is like a powerless, weak, and timid girl, and therefore avoids the glance of other men, which he is not able to endure.

The eye of the Italian, for example, glows with the ardour of his feelings, and flashes with the fire of passion; in that of the inhabitants of the northern parts of Europe, repose, reflection, and energy are expressed; and in the lower classes of many nations an inferior degree of morality, and a coarseness of feeling is plainly marked in the eye. Again, let us observe the character of the eye in the people of enslaved nations who drag on their miserable existence under the yoke of oppression; whose hard lot represses all feeling of rapture when they look upon the fair face of Nature; to whom every sun-bright morning brings fresh pain; to whom the hours of each returning day move with too slow a pace; because their natural freedom is restrained, their physical and mental strength impaired, and in a word they feel disgusted with life itself. In their eyes are exhibited the signs of hatred, despair, and suppressed fury. The eyebrows and lids are convulsively contracted. The gloomy eye moves heavily, timidly, without freedom, and for the most part in straight lines. The look is destitute of animation, expressive of deep misery, or wild and furious.—How different an appearance, on the other hand, does the eye present among the people of free nations, where an ennobling sense of liberty stirs in the breast of every individual; where freedom is not licentiously abused, nor circumscribed by particular modes of faith; where all the citizens of the state

enjoy equal rights and privileges; where talent, industry, and love of order prevail; where arts and sciences are cultivated, and where prosperity accordingly reigns; where every individual may enjoy without molestation whatever his industry and talent have helped him to obtain; where, in a word, man knows and feels the value, and enjoys the blessings of life: in such nations the eye expresses the satisfaction and delight which is felt in existence. Free, open, bright, full of soul and intellect, the eye looks fearlessly around. Here are perceived neither the mistrustful and lowering eye of a Philip the Second, nor the fearful and misanthropical glance of a Nero or Caligula.

APPENDIX,

OR PRACTICAL OBSERVATIONS ON THE EXPRESSION OF
THE EYE, ESPECIALLY OF THE LOOK.

THE extreme importance attached to the expression of the eye in the knowledge and cure of diseases was known to the very earliest physicians, and has been at all times acknowledged by such practitioners as have been guided by a true spirit of philosophy. But it is not only while the body is labouring under disease, that the expression of the eye merits our attention; it is of no less importance, in the healthy state also, to every person, and especially to the metaphysician and the moralist, who would form a correct estimate of the mental character, the intellectual powers, the moral condition, and the habitual disposition of others, as well as of the state of feeling existent at the moment of observation. To this expression the parts immediately surrounding the eye certainly contribute in no inconsiderable degree, yet are not so important as the eyeball itself, in which

the most essential and characteristic mark of distinction is the look. I shall therefore endeavour to call attention to some of the principal points, by which we may judge of the character of the mind from the expression of the look. But in order to be clearly understood, I must suppose the reader to have made himself acquainted with what has been said respecting the look at the commencement of the fourth chapter.

In our intercourse with mankind, we may readily observe, that every individual leads a particular mode of life, to which he feels himself unconsciously attracted, which is accordingly peculiar to himself, and which always presents some difference, however slight, from that of another. This peculiarity of the individual depends principally upon the character of his mind, and arises from his *mental temperament*, as we shall here term the innate constitution and natural disposition of the mind. This mental temperament is born with man, and hence is named in one respect natural talent or capacity, in another, character, or may be termed individuality.—The eye is a mirror of the mind; the mental temperament is accordingly reflected in the eye, and thus determines the peculiarity of the look. Now as this temperament differs in different individuals, there will be the same difference in the look.

It is certainly not to be denied, that the look may be modified by the occupations of life; but when

men devote themselves to those pursuits to which they are led by some inward inclination, or for which they possess talent or capacity, the modifications of the look are in these cases such as only to express the mental temperament in a more marked and decided manner. In the case, in which an individual has been compelled to devote himself to an occupation or calling contrary to his inclination or natural talent, the look natural to him will be scarcely modified at all, but will retain its original character, especially at times when he is not occupied. But where it has been actually modified by the occupation, the mental temperament of such an individual is either ambiguously expressed, or an objectiveness, a constraint, and deficiency of intellectual power are present, which will be manifest in the whole demeanour of the individual. Near-sightedness and far-sightedness may also have some influence upon the look. When these conditions of the eyes have not been induced by disease, nor, as in the latter case, by old age, but are occasioned solely by the occupation, the look resulting from the mental temperament will always prevail at those times when the individual is not occupied; this is likewise the case in the near-sightedness arising from habit.

From what has been already stated it is evident, that by the difference of the look in different persons we may be guided in our estimate, and justified in drawing conclusions, respecting the

mental temperament, or individuality of man, and this is precisely the aim of the observer in studying the expression of the eye.

Every individual then has a look peculiar to himself, which he retains constantly, at the time when he is inactive and at rest, and in some cases even when he is occupied. This might accordingly be named his *habitual, ordinary, or every-day* look; and it is this look to which we must pay especial attention in drawing conclusions as to his mental individuality, and of which alone it is my intention here to speak. Above all it must be remembered, that the look depends partly on the motion of the eyeball, and partly on the convergence of the axes of vision; and that its difference is determined by the various modes of this motion, by the different degree and kind of this convergence, and by the variations in the union of these conditions with each other.

When the eye passes from one object to another in curved, or undulating lines, this kind of motion indicates a frame of mind, which is in harmony with itself, with the body, and with the external world, and which is readily inclined to gratify other persons in such matters as are in accordance with its own principles and feelings, or are in themselves harmless and innocent. If these curved lines are directed downwards, they are generally a sign of unpretending modesty; if upwards, they often denote a noble and generous mind. When

the motions are performed in straight lines, on the contrary, they indicate a frame of mind, which is more or less discordant with itself or the external world, or they are signs of a moral perversion, an immoral bias, and base or wicked designs. If these motions are in a perpendicular line, they generally denote coldness, indifference, severity, haughtiness, or arrogance; if in a horizontal line, they signify uneasiness, discontent, deceitfulness, falsehood, or fraud.—Those motions which are performed within a space of tolerable extent, without a new field of view being presented to the eye by the motion of the head or of the whole body, indicate facility and aptitude in the use of the mental powers. If, on the contrary, the field of vision is narrower, and much circumscribed in extent, it may be concluded that these powers are limited, and exerted with difficulty.—Those motions which are performed very quickly, hastening with a certain rapidity from one object to another, where the eyes seem to rove over them all rather than to dwell upon any single spot, mark a degree of levity, frivolousness, volatility, inward restlessness, and indecision, and not unfrequently foppishness: those which are slow, undetermined, and apt to miss the object are a sign of mental incapacity, or helplessness; and if besides this the eyes are not able to become fixed, of stupidity.—The motions which are determined, measured, and performed surely and quietly, where the eyes appear to dwell upon every single point, are

signs of the exercise of decision, solidity of judgment, accurate observation, and an understanding prone rather to practical and experimental observations, than to the framing of theories. The look which has been designated (p. 78,) as pleasing and attractive, indicates a tendency to cheerfulness, contentment, and serenity; the unpleasant and repulsive, on the contrary, a tendency to dejection, discontent, and querulousness, or fretfulness, or may even denote an inclination to sensualism.—With regard to the motion of the eye, the following general rule holds good: the eye must employ the infinite variety of its motions with moderation, if it is to indicate internal harmony, freedom of mind, and capacity.

These motions however in themselves, as we have hitherto regarded them, denote only something inferior, belonging to the sphere of the senses; it is the look alone, as effected by the convergence of the axes of vision, which gives to these motions the true expression, and imparts the higher, intellectual character resulting from, and indicating the mental temperament of the individual. To illustrate this by comparison with a picture, the motions of the eyes might represent the ground-colour, and the variety in the convergence of the axes of vision might answer to the colours employed in the outline and shadowing; the picture results only from the union of the whole.

In the new-born child the axes of vision are

found in a state of parallelism, existing however but for a short time ; this parallelism likewise takes place in the hour of death. In those unfortunate persons who labour under deficiency of intellect, and in idiots, the axes of vision are very nearly parallel, so that in these instances, though the eyes have motion, they have a vacancy of look ; because the expressive look is only produced by a certain degree of inclination of the axes of vision. The axes of vision in the expressive look must therefore always converge to each other, and cross at a certain point—the point of convergence. If this point fall short of the object, the look is *sensual* ; if it lie beyond it, it is *contemplative* ; if upon the object, *intelligent*. These are, as I have already explained (p. 76), the three essential distinctions of the look as depending merely on the axes of vision, and which on account of their importance I have thought it necessary to repeat here once more.

The habitual or every-day look, named the *sensual*, having a point of convergence which, though falling always short of the object, may lie at various distances from it, does not regard all the different objects which present themselves in the field of view, as an entire whole, but expresses rather an effort to single out some particular object, or even some portion only of an object with which it may occupy itself more exclusively. In this case there is in the mind some determined bias, some natural capacity, which, if correctly appreci-

ated and followed, allows the individual to succeed in one particular line of life, for which he is best fitted, but seldom in any other. He feels himself attracted by common and familiar objects, which he employs in the ordinary manner for their ordinary purposes, neither impairing nor improving them. In him the activity of the eyes and of the hands are always united upon the same object, and the point of convergence of the visual axes therefore does not extend beyond the reach of his hands. The mind of such a person is satisfied with the things which it ordinarily finds within a narrow circle of vision; it has no other want; the look therefore never rests upon objects at a great distance. His ideas do not rise beyond sensible objects, and his mind is not even inclined to reflect upon impressions and ideas derived through the senses. The individual is perfectly satisfied with the enjoyments of sense; is more indifferent towards the moral feelings; is contented to hear lessons of morality without taking farther notice of them. Such men are not exactly to be feared, but it is necessary to be on our guard in our intercourse and dealings with them.—In this look the short distance of the point of convergence is in just proportion with the motions of the eyes within a limited field of view.

The habitual look to which the term *intelligent* has been applied, where the point of convergence coincides with the object, indicates a prevailing

effort to single out and fix upon a particular object, or some part of it, yet to view it at the same time in the aggregate. Here also there is a natural bias in the mind to apply itself practically to ordinary things; but there is more freedom in the exercise of its powers, and the mind reflects upon the ideas acquired through sensation. The objects are used it is true with a regard to their ordinary purposes; yet they are also compared with other things, and employed in connexion with them, and in various and experimental ways, from whence improvements and inventions frequently arise. Such men unite acuteness of the senses with the power of acute observation; they are ready in devising expedients and skilful in investigating the true causes of things; and, according to the adage, know how to "hit the nail on the head." Their mind is not insensible to enjoyments of sense, yet does not feel itself satisfied with them; it seeks its gratification much rather in methodical activity and in the exact sciences, in mathematics, mechanics, and in experimental inquiry. With regard to ethics, the individual inclines to rationalism; he believes only what the understanding comprehends; he loves that which is true and just both in word and deed. Such men are cautious and suspicious in every thing, but when once their minds are convinced, they are decided in their actions, and are therefore to be relied on; in them our confidence will not be misplaced.—With this

look the motion of the eye, as performed in a definite and measured manner, stands in near relation.

The habitual look, termed the *contemplative*, having a distant point of convergence which, though always behind the object, may lie at various distances from it, attends principally to the ensemble and less to individual parts, although it by no means overlooks the latter, or leaves them unobserved. There is here a natural inclination, not strictly speaking to extraordinary things, but rather to those which are not immediately obvious at the first glance, not quite common and familiar, and the true nature of which is only to be learned by meditation and reflection. Persons of this class do not make use of the things that come next to hand in a blind and empirical manner ; and when they are occupied with ordinary things, they perceive more in these objects than actually appears in them, or they see rather their own ideas reflected in the objects than the objects as they simply appear. They are comparatively indifferent to the enjoyments of sense, although they do not despise them ; they live rather in the more refined enjoyments of the mind, are inclined to meditation and contemplation, to philosophical pursuits, and delight in framing theories. In a moral point of view, they perceive and honour that which is just and true in word and deed ; sometimes however this perception, or knowledge, is overpowered by an

intensity of feeling, which borders on the domain of passion, but reason and the sense of right most frequently regain the ascendancy. Men of such character though certainly never guilty of fraud or deceit, require to be treated with the greatest delicacy, attention, and respect; otherwise they are not to be relied upon with implicit confidence.

There are persons with this kind of look of whom it may be said, that they seem to spend their whole life in thought, that is to say, those things upon which the multitude reflects and acts for the gratification of the senses lie not within their sphere of view; the point of convergence lies very distant, and they seem to look through and beyond the nearest objects. In this look there is expressed an effort to embrace all the different objects, which present themselves in the field of view to the eye, in their relation to each other, and to comprehend each object singly in its whole extent, and in its individual parts, under one view; and the mind contemplates and regards the infinity of objects as an absolute whole, and each individual object as a relative whole. This look indicates a serene, open, imaginative, intellectual nature, full of inward pleasure and satisfaction, and is observed chiefly in men of creative mind and active imagination, in the truly wise and learned, in eminent philosophers, poets, and artists.—The free and pleasing motions, which the

eye describes in the curved or undulating form, are generally found in this kind of look.

One or other of the three different looks, of which I have just spoken, always occurs in the ordinary act of seeing, and the mind has herein no other purpose than simply to see. When on the other hand the axes of vision have a certain firmness in their convergence, when they are arrested as it were at the point of convergence, either transiently or permanently, the look in this case becomes fixed, and according to the relation of this point to the object, the fixation may be either sensual, contemplative, or intelligent. In the fixed look, the mind has always a certain design, though it may be merely that of recognising the object distinctly; there is consequently in this look an active relation of the mind to the object, occasioned by a sensation either of pleasure or uneasiness, excited by the object in the mind, and resulting from a high degree of mental susceptibility. Hence the fixed look, when it has not for its purpose to see objects more distinctly, always indicates some tendency to an affection or passion. To take the extreme cases, for example; an individual, whose look is but little or not at all capable of fixation, will be without affections or passions, while that person whose look becomes fixed on almost every occasion of using the faculty of sight, will be of an impassioned character.

Fixation when combined with the look which

was termed (p. 77) the unsteady, is a sure sign that a mental emotion, *i. e.* an affection or passion is in existence for the time. In those affections in which the mind feels displeasure or aversion, the steady look becomes unsteady, and is united with the unpleasing and repulsive look: If the emotion be violent, or produced suddenly and unexpectedly, the eyes are indeed fixed, and at the first moment may appear even paralysed, but, after a time, they begin to roll wildly and irregularly. In those affections also in which the mind experiences pleasure, the steady look may become unsteady, but is combined with the pleasing and attractive look. In these emotions the eyes seem at the first moment to be fixed, but this fixation soon ceases, and when the pleasurable feeling has reached its highest pitch, the eyes may appear from their easy, free, harmonious play, and their circular motion, to dance, as it were. The eyes in this state move exactly in the same manner as if they were following the motions of the dancers in the waltz. The dancers describe a double circular course, turning round continually while they describe the larger circle as they proceed. If now we imagine this motion of the eyes to be produced not from an external cause, but from an internal impulse, they may be said, in this sense, to dance. Thus Apuleius* mentions a pantomimic represent-

* Opera Omnia, ed. Ruhnken. Lugd. Bat. 1785. Tom. I. p. 745.

ation of the contest of the rival goddesses for the prize of beauty, in which the eyes of Venus were said to dance.

A bright lustre, a brilliancy of the eye indicates an exciting affection or passion; if there is warmth and animation in it, the affection is of that kind in which the mind feels pleasure; if, on the contrary, the lustre is sharp and glassy, as it were, the affection is of that kind in which displeasure or aversion is felt. When the eye is void of animation, or even of its ordinary lustre, and has a dull and death-like aspect, a depressing affection is present in the mind.

A dark-coloured iris denotes generally a choleric or melancholic, and a light-coloured, a phlegmatic or sanguine temperament. The colour of the iris has therefore much connexion with the habitual or natural disposition of the mind as depending on the bodily temperament; from this rule, however, there are many exceptions.

A tendency to sadness and melancholy, or to enthusiasm and eccentricity, may be suspected from that habitual condition of the eye, in which the cornea is more than usually concealed under the upper lid. These varieties of the look, and these conditions of the eye have been minutely described in pages 79—81, to which therefore I must refer, to avoid repetition.*

* The preceding observations are not unimportant in their application to the plastic art.—The purpose of this art is not

Infinitely diversified as is the expression of the living eye, it would in all probability be found, by

merely to mould the stone into the fair proportions of the human figure, or to delineate inanimate forms on the canvass, but to render perceptible in the representation the individual relations of the figure to the external world, and to convey the idea of life and motion in the attitudes and repose of the forms. With respect to the look, in the representation of living individuals, this purpose will be effected, if the art exhibit the habitual look, and if this look has been accurately caught and represented, the individual mental character is rendered perceptible in the eyes. This is almost impossible in figures of diminished size, and in colossal figures often very difficult. Now although it is not possible to represent the motion of the eyes and of the axes of vision themselves, these ought not to be disregarded by the artist, inasmuch as it is only from observation of these motions in their continuance, and especially of the axes of vision, that he can discover the true habitual look. In portrait-painting therefore, the person whose likeness is to be taken should not fix his eyes constantly upon any particular object, much less upon the artist himself, because by this means the habitual convergence of the axes of vision is altered; the eyes should be allowed, on the contrary, to have their free play, and since the individual is quite inactive during the taking of the likeness,—and consequently may often fall into deep thought, which would likewise alter the habitual look,—it is even necessary that the artist should observe the eyes of the person who sits to him, during the moments of active life, in order to seize the habitual look, and to represent it faithfully. Whatever the painter may impart to the eyes by the delineation of their form, or by means of colour, light and shade, if he does not accurately represent the expression of the habitual look, as depending on the degree of convergence of the axes of vision, the mental individuality of the original will be wanting in the eyes of the portrait. In portraits where the head is taken in profile, the expression of the eye is certainly more easy to represent, on which account they have usually greater resemblance; but they are less satisfactory to those who seek in the eyes of the portrait the expression of character which is found in those of the original.

paying close attention to its indication, and especially to the principal points from which the indication results, that the convergence of the axes of vision denotes the mental temperament; that the motions of the eye are influenced chiefly by the power of the senses; and that the condition of the eyelids and eyebrows is more immediately connected with the organic life, or the constitution of the body. But now as life does not show itself in man under an aspect thus separated, but is uniform in its nature, if the indication or expression presented by the eye itself, and by its neighbouring parts, be taken together, and viewed as a single connected whole,—this must be regarded as a complete image, externally reflected, of the quality and condition of the mind within, especially of the feelings, which are the central point or focus, as it were, of the entire life of man. Consequently the expression of the eye, taken in its whole extent, is in itself adapted to furnish us with a criterion, from which we may draw conclusions with tolerable precision as to the different conditions and emotions of the mind, and the true individuality of man himself.

A few glances thrown upon the eye of an individual will be sufficient to convince an acute and reflecting observer, whether the mood of mind indicated by his eyes is habitual, or merely casual and temporary; whether his mind possesses capabilities, and if so, of what kind, or whether his

capacity is limited ; whether his prevailing bias is to morality or immorality, and what is the leading virtue or vice in his character. The intentions of a person, either in speaking or acting, may be conjectured from the eye ; and if the conversation which we hold with him turn upon any previous occurrences, we may guess from the testimony of his eyes, though in direct contradiction to the words of his lips, whether, and how far he has been concerned in them, by what motives he was influenced, or what objects he had in view.

It is evident, therefore, how highly important to legal practitioners must be the testimony of the eye in the examination of witnesses, and in the general conduct of trials and criminal investigations.

The feelings, as I have already several times observed, are the centre of the mental existence, from which all the inclinations and impulses emanate, towards which all the sensations tend, and the existent state of which is reflected, and rendered perceptible in the eye. But there is yet another power in man, which is the highest rule for his actions, which holds a place above the reason and the will, and appears to be implanted in the human breast by heaven itself. This power is the conscience,—an inward tribunal, which, lying above the jurisdiction of man, is an unerring standard, teaches him truth and equity, and holds him responsible for his sentiments and

actions. Its voice never deceives. Man appears evidently to have a twofold nature within him; he commits sin, and punishes himself; he is at once criminal and judge, at once offender and accuser. In vain does he seek to take shelter and conceal himself behind sophisms and subtilties; he can never remove the evidence of his guilt from the inward tribunal, nor avert its sentence. The offence which he has consciously committed is echoed unceasingly in the mind; consciousness accuses, the conscience judges, from whence arises a contest in the feelings; and it is this contest of the feelings, this inward disturbance and struggle, which, how much soever the countenance and external demeanour may be commanded so as to give no indication of it, is truly reflected in the mirror of the soul, the eye, and here rendered manifest.

The propensity to lying, for example, is represented by a restless and confused play of the eye; guilt and crime by a shy and timid eye, shrinking from observation, and by dark and gloomy looks which are sometimes forced into a good-humoured, or even sprightly and bold expression, but the self-absorbed and repulsive looks, which mark the inward disturbance of the mind, always predominate. In abandoned criminals, in the high-way robber, and the murderer, the consciousness of guilt and infamy weighs as a heavy burden upon the countenance. The remorse and pangs of conscience wrinkle the forehead, convul-

sively contract the eyebrows and eyelids, and draw them deeply over the eyes; the eyes themselves look gloomy, timid, distrustful, restless, full of anxiety, and laden with guilt. The struggle of the inward feelings, and the torments occasioned by the consciousness of guilt and the remorse of conscience are too evident to be mistaken. The eyes of such criminals become fearfully distorted, sleep flies from their lids, and spectres and phantoms are apt to present themselves to their imagination.

Now if in conducting a criminal inquiry, the counsellor or judge, free from all prejudice, observe with attentive and scrutinising glance the eyes of the prisoner, though he will not find in them evident proofs of guilt or innocence,—yet by comparing the expression of the eyes with the gestures, demeanour, and statements of the accused person, and all these again with the fact and the circumstances connected with it,—he will at least arrive at such conclusions as may serve to guide him in the examination, and to establish the probability of the guilt or innocence of the party, or may even bring the prisoner himself to confession. This presumptive evidence, given by the eyes of the prisoner, is, it must be admitted, uncertain and not actually conclusive; but has not experience proved that such evidence has been frequently the means of arriving at certainty?

But, it will be said, there are malefactors and cri-

minals long hardened in guilt, who possess so much control over themselves, that neither in their speech nor demeanour, neither in the features of the face, nor in the expression of the eyes, do they betray any sign whatever of the presence of conscience.—We admit that these reprobates may exercise such command over themselves, as long as they are surrounded by members of the legal profession who are observing them with attention, or as long as they stand at the bar, and before the judge himself; but if the reflecting psychologist proceed with assiduity and acuteness of observation, and visit the prisoner in his cell at different times in the day,—no other person being present,—and converse with him for a long time upon different subjects, especially in the evening—when the shades of night are coming on, the entire expression of the look and the play of the eyes—even of the most hardened criminal, will assuredly furnish proofs that man can never withdraw his guilt from the tribunal of conscience.

Lastly, the study and knowledge of the indicative character of the eye is of the highest importance in the inquests and post-mortem examinations held on the bodies of persons who have been murdered,—if the person who has committed the crime, or who has been concerned in it, is present in the house or apartment where the examination is carried on.

If in such cases an individual is observed to look

round in an anxious, uneasy, and confused manner, at one moment with a sad and dejected air, and at another with affected unconcern, or forced cheerfulness; if there is an unusual bustling activity and restlessness in his manner; it may in general be fairly suspected that he is either the actual perpetrator of the deed, or has been at least an accessory, and is consequently arraigned at the bar of conscience. The eyes here always give the first intimations of guilt. The psychologist must certainly observe with especial care and attention the eyes, as well as the countenance and behaviour of this person, and before he forms a determined opinion, he should endeavour to ascertain by close inquiry the following particulars:—

1. What is the character of the person in question, both as to his moral conduct, general habits, and mode of life?

2. What is his habitual state of feeling; whether it was previously different from that which he evinced during the inquest and examination?

3. Whether he has on all occasions manifested a great degree of horror at the sight of a dead body?

4. What is his general demeanour; and whether it is reserved, anxious, and timid in the presence of strangers, and especially of officers of justice?

5. Whether he has been nearly and intimately connected, either by the ties of kindred, or in any other way, with the unhappy person whose death has been the subject of investigation?

PART THE SECOND.

**ART OF PRESERVING THE EYE IN A HEALTHY
CONDITION, AND OF IMPROVING THE SIGHT:
MANAGEMENT OF OPHTHALMIC DISEASES
IN THEIR INCIPIENT STAGE.**

INTRODUCTION.

IN the first part of this work I have described the eye and its several parts, their uses and functions, and the mode in which vision is effected ; I have also shown the intimate and inseparable relation which subsists between the eye and the mind, and the importance attached to this organ in many other points of view. I have thus I think fully demonstrated, that the eye is the noblest and most indispensable organ in the human frame ; that it is an organ, through the medium of which the whole range of nature with its infinity of objects is presented to the mind, and which by its indication of the thoughts and feelings reflects with vivid beauty even more than it receives ; an organ, by the loss of which the harmony of the bodily faculties may be materially disturbed, and man is excluded from the active employments of civil life, as well as from the pleasures of social intercourse ; an organ, in short, so essential to the enjoyment of existence, that even the aged man, for whom life possesses few remaining attractions, and who

feels no alarm at the prospect of death itself, trembles at the idea of being deprived of the benefits dependent upon its exercise.

“ To die is nothing—but to draw our breath,
And see not this fair world in which we live,—
This, this is misery ! ”

SCHILLER, *William Tell*, Act. I. Sc. 4.

In consequence of its complicated and wonderfully artificial structure and its extreme excitability, the eye is subject to a great number of morbid changes, which are for the most part brought on by the stimulus of light, and the various and frequent uses that we make of this organ; and by means of its intimate union with the organization of the whole frame, and the mutual relations (which are not inconsiderable) subsisting between this and other organs, it is often implicated in the diseases which attack the body. To all persons, therefore, who feel duly impressed with the importance of the sense of sight, it must appear desirable to become acquainted with the principles upon which the normal exercise of that sense depends, with the means of preventing the manifold sufferings to which the visual organ is liable, and with the steps to be taken on the first appearance of symptoms of an ophthalmic disease.

CHAPTER I.

THE EYE IN INFANCY.

THOUGH in the human species the eye is perfect in its construction at the moment of birth, no more than the *mechanical* apparatus requisite to the act of vision is as yet complete. The visual organ at this period may be compared to an optical instrument, behind which an eye, that is able to look through it, and recognise the objects presented to it, is still wanting. The actual exercise of vision, *the subjective seeing*, that is to say, the power of recognising and distinguishing objects, or forming an idea of them by means of sensation, does not commence till a later time. The new-born child appears to seek the light with its eyes on account of the pleasant sensations it produces; and thus the most beautiful organ of the human frame is developed under the all-enlivening influence of that element to which it is itself the most nearly allied—in the same manner as the plant turns towards the sun and unfolds its fairest flowers beneath his rays, whereas, if debarred from the access of light, it would but languish for a time, and at last perish.

In the very act of birth occasion is frequently given for a subsequent disorder of the eyes, either from pressure upon the forehead and parts surrounding the eyes, in cases of difficult parturition, or from the contact of acrid fluid. Such sources of injury, and especially the last, are certainly by themselves qualified to occasion that dangerous inflammation of the eyes which so often occurs in infants; but there are generally several other causes likewise present which produce it even independently of those already mentioned, viz. an abrupt transition from darkness to light, want of cleanliness and proper culture of the skin, and especially cold resulting from a sudden change of temperature; and the greater the number of concurrent exciting causes, the more pernicious of course will be the effect.

Although light exercises upon the eyes of the infant a stimulus as yet quite new to them, it is by no means to be recommended that children should be excluded from the beneficial influence of light, but rather that they should be gradually accustomed to it,—precaution being used to guard them against a very strong or dazzling light, and against sudden changes. The cradles of infants ought not to be entirely darkened by curtains; but where this practice is adopted, especial care must be taken not to allow a strong glare of light to fall upon the eyes of the child while in bed, and not to carry it suddenly from thence to the window

for the purpose of showing it to visitors. If it should be necessary to approach the bed with a candle, the hand should be held as a shade before the light, that there may be no danger of wakening the child,—as in that case the bright light must be unpleasant and injurious to the eyes.

It is highly important that the new-born infant should be kept in a state of perfect cleanliness; more especially, it should be cleansed with much care immediately after birth, at which time a sort of unctuous matter covering the surface of the skin frequently clogs the eyes. The water which is ordinarily used for bathing the child is not pure enough to be employed for cleansing the eyes, but generally contains some foreign substances which must be injurious to them. Perfectly pure water, without soap or any other detergent material, should therefore be used to wash the face. The same sponge, moreover, with which the rest of the body has been washed, ought never to be employed for the eyes, but another, very soft and perfectly clean, should be taken for this purpose. It is requisite further to pay attention to the crying of the child, as this is generally a sign that its cloths are soiled or wet, and if they be not changed in such cases, a cold is very likely to ensue from this neglect. The child should be washed all over, or, which is still better, bathed at least once a day in simple warm water, or in a decoction of bran,—which is to be especially recom-

mended for weak children. The eyes should be cleansed each time, in the manner before prescribed, and the utmost care must be taken to avoid cold both during and after the bathing,—for which purpose the room should be of uniform temperature, and the linen well warmed. Keeping the whole body clean, attention being at the same time paid to the skin, exercises a very beneficial influence upon the eyes of the child.

While the infant, as I have already mentioned, is to be by degrees inured to the light, it is necessary at the same time to proceed gradually with the reduction of warmth. Previously to birth, all the parts of the body enjoyed a higher and equal degree of temperature. For this and for another reason, which has reference to the structure of the heart in new-born infants, they must be more warmly wrapped up at first than at a later period; and even the face should be covered with a piece of gauze, inasmuch as this part of the body being at this period not less susceptible of injury from exposure to cold air than the other parts, from the neglect of such precaution a tendency to complaints of the eyes is often induced. Whilst tepid, and afterwards cooler water is substituted for the warm water at first used for the bath, the temperature of the apartment must be also reduced gradually and with caution. Among the maladies produced by sudden change of temperature, complaints of the eyes

by no means unfrequently occur, which are the more easily excited when mechanical irritation is exerted upon the eyes at the same time. Particles of dust, and impure air may be mentioned among such causes of irritation. The cap worn by the child is also sometimes so profusely decked with lace and ribands, that their edges come in contact with the eyes; the least evil resulting from which is a sensation of pain. We all know the unpleasant feeling occasioned merely by a hair touching the eye. From this inconvenience it is in our own power to relieve ourselves, but the helpless infant on the contrary is compelled to endure the pain, till either chance, or an intelligent nurse comes to its aid.

Although the ophthalmia of new-born children occurs most frequently within the first week after birth, there is a particular liability to it during the first six weeks. It begins with a slight redness at the corners of the eyelids, which adhere together at this part by means of viscid secretion, and are also somewhat swollen. The eye is not able to bear the light, and in many cases the child sneezes frequently.

As soon as these symptoms are observed, let the temperature of the room be a little raised without delay; let all draughts of air be carefully avoided; and let the child be kept warm. The child should now be bathed twice a day in warm water, and having been after each bath wiped quickly and

thoroughly dry, should be placed immediately in a warm bed. All noise ought to be excluded, and as much rest as possible allowed to the child, as the least interruption may in a short time bring on an aggravation of the symptoms. If the eyelids are ever so little glued together, they must never be forcibly separated, but the gummy matter must be softened by means of pure tepid water applied with a soft piece of fine linen, or rather with a soft clean sponge; if some object be now held before the eyes of the infant, it usually opens them of its own accord. It is very beneficial to cleanse and wash the eyes of the child, even when in a healthy condition, frequently and carefully with tepid water. When one of the eyes only is attacked by the disorder in question, the healthy eye must not be cleansed with the same sponge or water which has been used for the unhealthy one, as otherwise the complaint may be communicated from the one to the other; but two sponges, and water in two separate vessels, should be always in readiness. If the swelling, redness, and secretion of mucus should increase, and if the skin should become dry and hot over the whole surface of the child's body, these are sure signs of an aggravation of the malady. In this case the observance of such rules is no longer sufficient of itself, and it is high time to transfer the care of the disease to an intelligent medical practitioner, in order to check, if possible, the farther progress of the evil.

This inflammation of the eyes in new-born infants (which is sometimes found to be very prevalent in lying-in and in foundling-hospitals, and then to a certain degree assumes an epidemic character) often reaches such a fearful height in a short time, that the most important parts of the eye are destroyed. Many persons whose eyes are disfigured, and others who are entirely blind, owe their misfortune to neglect during this disease. Parents therefore, and all persons to whose care children are entrusted, cannot be too strongly urged to have recourse to medical assistance immediately on the least aggravation of the symptoms, and by no means to lose time in trying first the effect of domestic or other remedies; for it not unfrequently happens that the sight even in a few days is irrecoverably lost. I have convinced myself by too frequent experience of the truth of this assertion. Dr. Mackenzie says, * “It is melancholy to reflect on the frequency of destroyed vision from this disease, especially as the complaint is completely within control, if properly treated. The attendants are not alarmed sufficiently early, by what they consider as merely a little matter running from the eye; and but too often it happens that medical practitioners are also betrayed into the false supposition, that there is nothing

* Practical Treatise on the Diseases of the Eye, 2nd. Ed. Lond. p. 433.

dangerous in the complaint, till the cornea bursts, and the eyes are for ever destroyed. Many children have been brought to me in this state; but the most deplorable instance which I have witnessed of this disease, when neglected or mistreated, was that of twin infants. One of the children had totally lost the sight of both eyes, while the other retained but very partial vision with one eye."

It must be observed further, that this disease is very contagious. For this reason all persons employed about the child who is labouring under the malady, are earnestly advised to be very careful that the mucus secreted from the eyes of the child does not come into contact with their own; since the smallest quantity of this contagious matter, conveyed unawares by the fingers to healthy eyes, will produce in them the same disease. I am acquainted with an instance of a nurse in a large hospital at Berlin, who by washing her eyes with the sponge used for those of the child, inoculated her eyes with this disease, which, as she did not seek immediate medical aid, made such rapid advances, that in twenty-four hours the one eye was entirely destroyed, and in the other, sight was afterwards restored by an operation only. Dr. Mackenzie relates* a melancholy example of this kind in an infant and its grandfather; the latter inoculated

* Practical Treatise on the Diseases of the Eye, 2nd Ed. Lond. p. 435.

from the former. "Both," says he, "were so severely affected that the infant had the one eye left in a state of total, and the other of partial staphyloma; while in each eye of the old man, the greater part of the cornea remained opaque and adherent to the iris."

The actual power of seeing in the majority of instances begins to develope itself in the second month after birth; there is no indication however that any idea respecting the objects seen is formed till the end of the first year. From the period of that development the eyes of the child are threatened with another evil, which in some measure injures the sight, and as it detracts greatly from the beauty of the countenance, is of considerable importance, especially to females; I mean squinting.

Squinting has its origin in a deficient action of the one eye in relation to the full action of the other, whence consequently the concurrence or unity of action of the different muscles in the two eyes is disturbed. While the sound eye directs its glance towards an object, the squinting eye remains inactive, and gives itself up to the accidental play of its muscles, which draw it out of its straight direction, and roll it towards one side or the other, generally inwards, because the inner muscle is the stronger. As in squinting only one eye is used for the purpose of seeing, the muscles of the other which remains idle are not brought into equal and harmonious

action with the muscles of the sound eye : and as the faculty of sight is then not exercised in the squinting eye, the natural consequence must be a diminution of the power of vision. Accordingly this eye is always the weaker. Squinting usually affects only one and the same eye ; cases in which both eyes squint either at once or alternately, are rare.

This evil arises from various causes : one of the most frequent is the presence of some object on one side of the child, which constantly attracts its attention in that direction. The curiosity of the child is excited, but as he has not strength to turn or move his head in the direction of the object, the eye of the corresponding side is exclusively attracted towards it, while the other eye remains quite inactive. This is owing either to an improper position of the cradle, when, for instance, a window, the fire-place, a mirror, or any other object is constantly on the same side ; or to the nurse or attendant carrying the child always on the same arm ; frequently also it may be the lace or ribands on the cap, a lock of hair, a pimple on the nose, or some object or other on the cradle itself which excites the curiosity, and rivets the attention of the child. By circumstances of this nature squinting is first occasioned, and in time becomes a habit. In some cases when the mother or the nurse squints, the child may acquire this defect from a kind of imitative instinct. Herein alone lies the reason that parents who squint often

have squinting children, and this furnishes at the same time a proof that the assertion frequently made as to the evil being hereditary is not founded in truth.

To prevent squinting, let the cradle be placed with its head towards the window, so that the rays of light entering the room fall not directly upon the face of the child, and let a screen be put before the fire-place. Let all objects likely to attract the attention of the child to one side be removed, and brought opposite to the foot of the bed; so that the child may be compelled to look straight forwards, and to view the objects with both eyes. Let some object or other be frequently held directly before the face, but not too close. Let the nurse carry the child sometimes on the one arm, and sometimes on the other; and, if one of the eyes should show any tendency to squint, let the child be carried oftener upon the arm which will best expose the squinting eye to the light.

If the habit of squinting has been already actually contracted, and has its origin in inactivity of the eye, disproportion in the action of the muscles, and diminished power of vision, the surest and only method of removing this species of the complaint is to keep the squinting eye in active and diligent exercise.

For this purpose, if the squint be directed outwards, let a piece of black sticking-plaister be laid upon the corresponding side of the nose; if in-

wards, let a lock of hair or some prominent object be suspended somewhere about the temple near the squinting eye, so as to cause the child to move its eye towards this point, and thus to use it in an opposite direction from the squint. But as the eye soon becomes accustomed to things of this kind, it is necessary to change the plaister or the lock of hair, if possible, daily. This method however is only to be recommended with very young children, and is not always attended with success. The following mode of treatment is a more effectual and almost infallible means of curing squinting.

Let some light kind of bandage be fastened over the sound eye, and let the child be directed to look constantly with the squinting eye towards any large object at some distance. The eye being weak is at first only able to endure this trial for a short time, not longer perhaps than ten or fifteen minutes; it then begins to redden, to be suffused with tears, and to feel painful; as soon as these symptoms appear, let the bandage be immediately removed. This experiment must be repeated several times daily, at first however only for a short time; the exercise may then be gradually prolonged, and tried more frequently during the day. After some time the child should be accustomed to observe smaller objects at a distance, then to read large print, and also to write, but always with the bandage before the sound eye. When these exercises

can be borne for a long continuance, the covering of the eye may be worn during the greater part of the day, and the squinting eye used in the open air, and especially in green fields or lawns, in order that it may be freely exercised in all directions. When at length the child finds no farther difficulty in viewing objects with the weak eye in all directions, and for a long time together, and has acquired the same degree of activity of the muscles, and the same power of vision in this eye, as in the other, the bandage may be entirely removed, and the child allowed to see with both eyes at once. It costs the child some effort at first to use both eyes equally and in a straight direction; he must therefore be urged to employ his whole and undivided attention upon the eye which had previously squinted, in order that it may not remain inactive as before, and that the muscles may not relapse into their former state of unequal action.—This mode of treatment cannot be too strongly recommended to parents and those who have the care of children, for a cure is sometimes effected thereby even in children no longer of tender age. It is true that two or three months are in some cases not sufficient to remove this evil which so much impairs the beauty of the countenance, yet the plan will be invariably attended with success, provided the necessary patience and perseverance be exercised, and the evil have not arisen from a high degree of short-sightedness, or from some actual disease or organic defect.

Every kind of squinting-spectacles, as they are termed, and all mechanical contrivances to remedy this evil, are of no avail; they very seldom answer the end proposed, and are in many cases even injurious. Their employment by no means compels the child to use both eyes equally; it still sees only with the sound eye, leaving the other inactive, and in the same oblique position as before. Besides this, the free access of light,—the proper element of the visual organ, and of fresh air also, is in a great measure prevented by them—circumstances which only favour the increase of the evil.

Squinting has frequently for its cause either an actual disease or an organic defect, and in some cases it is a symptom or the consequence of some other serious disease, as inflammation of the eye, opacities of the refractive media, specks on the cornea; disorders of the retina; weakness, spasm, palsy, or shortening of the muscles of the eye; tumours within the orbit; irritation from water on the brain, worms, or other causes affecting the digestive organs; hysteric fits, and emotions of the mind.—In abdominal irritations, we may first try the effect of an active purgative, and then of mild aperients, using at the same time a light and carefully regulated diet; but in all other affections recourse must be had as early as possible to a skilful practitioner.

There is another species of squinting, or oblique position of the eye, named *luscitas*, which remains to be noticed. In this case, when the sound eye

is closed, the defective eye cannot by any means be brought into a straight direction, but maintains constantly its oblique position. As the observance of general rules is of no efficacy against this evil, it must be left entirely to the judgment of the medical attendant.

Squinting is frequently brought on gradually in later years merely by neglecting to use both the eyes together; when, for instance, objects are viewed chiefly with one eye, or when the use of a single eye-glass is resorted to. Here it depends upon want of exercise of the one eye; and the weakness of vision thereby occasioned is to be counteracted by using the squinting eye in preference, and by the method before mentioned.

CHAPTER II.

THE EYE IN CHILDHOOD.

THE mind and bodily frame of the child begin now to be more and more developed. The organs of the senses evince great activity, and become by degrees more acute in the perception of external objects; the child learns gradually to distinguish between different sensations. The vital powers display greater energy, and all the functions are performed with greater freedom. The process of assimilation is very active, and the system requires nourishment in greater quantity and of a more solid nature; accordingly the organs of mastication are under development, and the teeth cut through the gums.

During dentition the child is more irritable, and is therefore more susceptible of diseases, especially of the head, because at this period the afflux of blood towards the head is more abundant and more powerful. Dentition, being a natural process of development, does not it is true by itself usually induce inflammation of the eyes, but it creates a tendency thereto, as is evident from their becoming more irritable, weaker, and unable

to bear the light, from their swimming as it were in tears, and being often closed.

At no period of life does the human body require greater care both with regard to the general health, and to that of the organ of sight in particular, than in the years of childhood—till the second dentition is completed, or to the end of the seventh year. Great attention to the skin is necessary during the whole of this period, in which the skin is to be regarded rather as serving the purposes of absorption and secretion, than as a defence and covering for the body. After the expiration of the first six months, it is no longer requisite to bathe or wash the whole body of the child every day, but only two or three times in the week, and at a later period this is required still less frequently. Care must be taken that the child be not overheated, and the cold liable to ensue on such occasions must be especially guarded against. No aliments of a kind to which its tender stomach is not yet accustomed should be given. Overloading the stomach is very apt to occasion an increased flow of blood towards the head, which often causes a serious inflammation of the brain, or of some other organ of the head. The bowels should be kept properly and regularly open, to diminish this upward pressure of the blood. Moderate exercise in pure air, and a due proportion of rest and sleep should be allowed. On getting up in the morning, the eyes must be

washed and cleansed with tepid water, applied by means of a soft sponge, and frequently during the day with cold spring water. Strong light should be kept off from the eyes, and if their irritability be very great, a green silk shade should be constantly worn.

With the end of the period of dentition the child has passed over one of the most critical periods of his life ; yet he is still threatened by a series of diseases, which may at the same time implicate the eye, are often followed by defects of sight that remain for the whole life, and may even entirely destroy the sight ; these are the small-pox, measles, struma, &c.

On the occurrence of small-pox it is well to let the child have one or two warm baths, in order to moderate the eruption in the face, to diffuse it more over the whole body, and also to alleviate it generally. Let the patient be kept in a large room, where the air is daily purified without occasioning draughts or change of temperature. Let the room be somewhat darkened, and if there is a fire in it, let a screen be put before the fire-place, so that all irritation from light may be prevented ; a precaution the more necessary, the greater the sensibility which the eyes evince to the stimulus of light. It is very wrong, especially in cases of cutaneous eruptions, to have curtains drawn entirely round the bed, since by this means the free access of air is prevented, and the air which has

been rendered unwholesome by perspiration is confined within the neighbourhood of the patient. Let repose and sleep be granted to the eyes, and let them not in any way be exerted. During the continuance of the disease, it is very advisable to touch the eyelids and the whole neighbourhood of the eyes with fresh tepid oil of almonds, several times in the day. Care should be taken to keep a free passage between the eyelids for the tears, which are usually acrid, and the lids should be carefully cleansed from them, as well as from all mucous secretion. If the lids should be glued together with this matter, the incrustation should be softened with clean tepid water, or milk and water, applied with a soft sponge, and all moisture should then be carefully dried. If the eyes are kept perfectly clean, the patient can in general open them himself as much as is necessary; not any degree of force, however, should be used for this purpose. When pustules are formed on the edges of the eyelids, and become filled with purulent matter, let them be opened with a fine needle or with a lancet, and let the matter contained in them be gently removed, using the greatest caution not to irritate the eye. The patient must be prevented from rubbing the eyes with his hands, lest the inflammation should be thereby increased; and care must be taken during the period when the scabs are falling off, that they are not, by rubbing the eyes, introduced underneath the eyelids.

When the disease is judiciously treated, and every attention is paid to the rules above mentioned, it usually passes off without further danger to the eye. If however the eyelids should be considerably swollen and inflamed; if they should be agglutinated along the whole edge; or if the flow of tears, and secretion of mucus, should be abundant, and together with these symptoms a violent burning and pricking sensation is felt in the eyes themselves, with oppressive pain in the head, an ophthalmic physician should be consulted without delay. To defer or omit having recourse to such assistance may probably have for its consequence a tedious disease, disfigurement of the eyes, or even a partial, if not total loss of sight for the whole life. The foundation of many tedious, chronic diseases of the eyes in children, is generally found on close inquiry to have been laid in a culpable neglect of timely or judicious assistance, while the child was suffering under some violent eruptive disease.

After the termination of the disease, a great sensibility to, and considerable intolerance of light usually remains for a long time; the eyes should therefore be spared as much as possible, long-continued rest should be granted to them, and when exposed to a strong light, a shade should be worn. The child should enjoy free and wholesome air, and, when it is possible, the eye should be allowed to rest upon green fields or places where there is verdure.

What has here been said respecting the small-pox is in a great measure applicable to all the other acute eruptive diseases to which children are liable.

I cannot suffer this opportunity to pass without mentioning with high respect the name of one who has the truest claims upon the gratitude of mankind—I need hardly say, that I mean Dr. Jenner. In his discovery of a preservative against small-pox by the simple method of vaccination, and by the subsequent general diffusion of his views in a work published in 1798, he has bequeathed to us a legacy which may be regarded as one of the greatest benefits ever conferred by an individual upon his fellow-men. It is much to be wished that all rulers of states and persons in authority would adopt such measures, and cause them to be so strictly enforced, that all persons, even the most ignorant, should be compelled to participate in this benefit. Then might the hope be cherished that the destructive, disfiguring disease, the small-pox—and with it the affections and injuries of the eyes, consequent upon this malady, such as *nebulæ* and specks on the cornea, partial destruction of the eyes, or even total blindness—might in time be banished from the civilised world. How prevalent the small-pox has been, even up to the present day in various parts of England, is sufficiently known through the medium of the public journals.

One of the most frequent morbid conditions in

childhood is the strumous disposition, which although only in rarer instances developed in aggravated forms, always renders the child more liable to be affected by other diseases, and may consequently prove very injurious to the eye, in common with other organs of the body. For the correction of the strumous disposition, and for the prevention and cure of the disease itself, a judicious method of constitutional treatment is of the greatest importance; it cannot therefore be too urgently recommended in strumous complaints of the eyes.

The strumous child presents evident external indications of its infirmity. The disproportionate size of the head, and the large tumid abdomen, contrast strikingly with the meagre neck, and the thin and imperfectly-nourished limbs. The skin, through which the veins are very apparent, is generally delicate, the glands are much developed; the hair is generally of a light colour, the eyelashes long and darker than the hair; the nose, covered with wide pores, is enlarged, appearing as if swollen; the lips, especially the upper, protuberant; the eyelids are sometimes glued together in the morning. The mind also is often precociously developed. Where these, or several of these external signs manifest themselves, the strumous disposition may always be suspected. Struma is an infirmity which is transmitted from parents to children, and is promoted by the use of impro-

per aliments; by living in abodes that are damp and dark, and filled with unwholesome air; by want of cleanliness; and frequently by the improper use of debilitating medicines.

Children who evince this disposition ought to reside in a light, wholesome, spacious dwelling; they should frequently use warm, and at a later period, cool baths of fresh, or which is still better, salt water; but sea-bathing is by far the most beneficial. After the bath it is advisable that the child should use moderate exercise, taking care however that he does not overheat himself, so as to induce a subsequent cold; for the putting strumous children to bed after bathing generally occasions debilitating perspirations. The object proposed by these measures is, that a pure, wholesome, and strengthening air may be received both by the lungs, and by the skin which has been well cleansed. Frequent exercise in an open and dry atmosphere is much to be recommended, but the child should then be allowed to take sufficient rest and sleep during the night, not however upon a soft feather-bed, but rather upon an elastic horse-hair mattress. The diet should be light, yet strengthening, and, if the child be very young, should consist of milk, the yolk of eggs mixed with water, veal or chicken-broth, and light, stale, white bread. After some time meat easy of digestion may be given, but vegetables, fruit, &c. should never be allowed till the third year of the

child's age, and even then fruit should be given very sparingly. The daily eating of potatoes or heavy and coarse bread is decidedly to be condemned. Milk and water is a suitable beverage, and at a later period a little porter, or unadulterated wine may be taken. Food and drink should be taken regularly, and never to excess. In children of irritable temperament, the mind ought not by any means to be over-exerted, but should rather be spared as far as possible; while in those of phlegmatic temperament, on the contrary, it may be actively exercised, and a suitable portion of time may be devoted to the rudiments of education. But the principal point to be attended to is, that they should take frequent exercise in the open air, and, if possible, in a hilly country.

By these means Nature is placed in a condition to prevent the development of struma, to check its further progress, and perhaps in time to reduce the whole tendency to the disease; hence also to prevent those affections of the eyes which arise from this source. If, however, from inattention to these rules, or from some exciting cause or other, a strumous inflammation of the eyes or of the eyelids should occur, it may be recognised as such by the following symptoms:—great intolerance of light; swelling and reddening of the eyelids, especially at the edges; redness of the conjunctiva; a discharge of acrid, excoriating mucus, which becomes quickly hardened to a crust, and aggluti-

nates the eyelashes, especially during sleep; a certain feeling of stiffness and spasm in the eyelids, heat and burning pain in the eyes, interrupted only by an occasional discharge of hot tears; and, lastly, by these symptoms being more violent during the day than in the night.

At the commencement of strumous ophthalmia, the first thing that requires attention is to cleanse the eyes carefully several times a day from the ex-coriating morbid secretion above mentioned. For this purpose tepid milk and water may be applied by means of a soft sponge, and the eyes should be well dried after each application with a fine linen cloth. On waking in the morning, the eyelids are usually so firmly agglutinated, that they cannot be opened without difficulty. Force must never be used on these occasions to separate them, but the incrustation is to be softened with tepid milk and water; or, if this is not sufficient, fresh oil of almonds, made lukewarm, may be applied by means of a fine camel-hair pencil. In pure strumous ophthalmia, where there is no concomitant catarrhal, rheumatic, or other affection, the local application of cold to the eye is extremely serviceable; as it not only alleviates the burning pain, but is also a remedy against the local inflammation of the organ itself. The following may serve as directions for the mode of application:—Let two vessels containing cold spring water be in readiness, and let a piece of linen folded five or six

times together be dipped into the water in one of these vessels, and then laid lightly upon the eyelids; and when removed, let it be washed in the water of the other vessel, before it is again used for this purpose. In order to obtain a high degree of cold, the moistened linen may be laid upon a piece of ice before it is applied to the eye. Several pieces of linen so folded should be in readiness; for it is of great consequence that each of them should remain upon the eye only for a very short space of time, and that it should be quickly changed, as otherwise the salutary influence of the cold is entirely frustrated, and the intended remedy becomes rather injurious than beneficial. The local application of cold should be made two or three times in the day, and continued each time till the burning heat subsides, and the eyes begin to feel cool.

Further, it is not advisable that the patient should remain in a darkened room, and it is highly injurious to lie upon the face, as children often do, to avoid the light. Instead of confining the child in a dark room, it is far better to let him enjoy the benefit of the open air, the eyes being defended with a shade, and care being taken to avoid strong light, sunshine, and sudden alternations of different degrees of light. It is true the light at first occasions much pain, and children often cry violently on this account; but it is absolutely necessary notwithstanding their complaints that they should be

inured to the light, as, by being withdrawn from it, they would be deprived at the same time of one of the most efficacious remedies against the intolerance of light which arises from struma. By removal from the light the sensibility of the eyes is still further augmented, and in a darkened room it is extremely difficult, often quite impossible, to cure this intolerance of light. Strumous inflammation of the eyes is in this respect different from all other inflammations of this organ.

If however in spite of all these precautions, the symptoms above mentioned should be aggravated, and accompanied besides with shivering fits, it is then high time to have recourse to suitable medicinal remedies under the direction of an ophthalmic physician, the strictest attention being paid at the same time to the rules above specified for the improvement of the general health. By such means only is it possible to prevent the partial or total destruction of the eyes often occasioned by suppuration, to alleviate and shorten the duration of this painful affection of the eyes, which often lasts for years, and to remove entirely the general tendency to the affection, which is especially liable to recur in spring and autumn.

This complaint is most prevalent during the time from the weaning of the child till about the eighth year of the age; during this period of life, therefore, the observance of the rules above given on the constitutional treatment cannot be too

strongly recommended, for, as Dr. Mackenzie observes,* “strumous ophthalmia is a disease to which children are so liable, that out of a hundred cases of inflammation of the eyes in young subjects, ninety are of this kind.”

With the season of childhood the mental education begins, and it is therefore of the highest importance, to lay down some rules as to the manner in which the eyes are to be used during the progress of instruction. Up to this period they have perhaps passed safely through all incidental diseases, and are in a perfectly sound and healthy condition; but the child is now kept close to his lessons, and these tender organs are often hereby so sadly abused, and not unfrequently so much exhausted, that from this cause alone complaints of the eyes are induced, which must necessarily not only interfere with the course of instruction, but must at a later period occasion restriction in the choice of a pursuit or profession, as well as privation of many pleasures of life.

One of the principal rules to be observed is, that the eyes be not engaged long and perseveringly in viewing minute and delicate objects, and that whenever they are occupied in this way, a suitable degree of light, judiciously regulated, be admitted. The eyes of children ought never to be exercised for a long-continued time in reading,

* Practical Treatise on the Diseases of the Eye, 2nd. Edition, London, p, 448.

writing, drawing, sewing, embroidering, &c. Their school-books should be printed in large type, and they should write only in a large hand at first. Care should be taken that the table on which they write, draw, or read, be not so high as to bring the book too near to the eyes; and that the child do not stoop, but sit quite upright, while engaged either in this, or in any other occupation. For the first music-lessons, music of that kind only should be selected in which the notes are large and clearly printed; for the reading of notes, especially in the evening, strains the eyes exceedingly. A frequent change of occupation should be contrived, and the mind should not be too much exerted simultaneously with the eyes. Even during the task the eyes should be allowed a moment of respite for the recovery of their strength, by being from time to time turned away from the object with which they are occupied, and directed towards the window, and if possible to a distant prospect, or to green trees or fields. As strong light is injurious to the eyes, it is improper to be placed, during the time of labour, in such a position as to have the eyes directly opposite to the window, or any white surface, such as a wall, for instance, from which the light must be strongly reflected. It is very beneficial for the eye, while occupied either in the school or at home, to have the table so placed that the rays of light may fall on the object upon which they are employed from above,

or from the left side. In the evening, such kind of light should be used, as may diffuse its rays equally throughout the apartment and over the table—the best for this purpose is a lamp with a milk-white or ground-glass shade; and the child should be less occupied with reading books or music than with writing, which does not require so much expenditure of sight.

The salutary influence which such recreations as viewing green fields and beautiful prospects in the country, and taking exercise in the pure, open air, exert upon the whole body, as well as upon the eyes, is too well known to require any recommendation. Games with hoops and balls, &c. are especially adapted to this purpose. In order that these bodily exercises should be performed with ease, the clothing ought not to be too tight, still less should the child be tightly laced; great injury resulting not to the eyes alone, but to the whole system, from this practice.

There is a very general and improper custom, which may have arisen merely from consulting the convenience of nurses, or other attendants upon children, namely, that of cutting the hair too short. As the hair appears to play only a subordinate part in the economy of the system till the commencement of the period of puberty, there can be no fear whatever that the growth of the child would be checked by wearing the hair longer; and it deserves in truth more attention, inasmuch as

from its shortness complaints of the eyes are not unfrequently occasioned, and when already existing are encouraged. We might be satisfied with cutting off the points of the hair; at all events it should be allowed to grow long enough to cover perfectly the nape of the neck. But then it must not be thought too much trouble frequently to wash and clean as well the hair itself, as the skin of the head beneath.

CHAPTER III.

THE EYE IN YOUTH.

THOUGH the development of the system may have approached as near to perfection as possible at this period, it has not yet reached maturity. Man has consequently at this time of life to pass through a very critical epoch, namely, that of puberty. The mind engages in a multiplicity of exertions at the same time, inasmuch as languages, arts, and sciences, have now to be learned, and the foundation is to be laid for future usefulness in the various relations of domestic and social life. In the formation of the mind, the eyes, being among the external senses the medium through which we derive the greater part of our knowledge, are much called into exercise, and often exerted to a great extent.

During the period of puberty, nothing is so destructive to the healthy condition of the eye, as long-continued and repeated exertion of the faculty of sight and of the powers of the mind at the same time. Since the eyes, as well as the mind, become wearied by uniform and unvarying occupation, the object of labour should be frequently changed,

especially in the evening. When the eyes feel the least degree of weariness, they should be closed for a few seconds, or turned to distant objects ; they will by this means recover their strength. It is not right to work immediately after meals ; while the body is heated ; in a stooping position ; or with a tight neck-cloth, or tight stays. Books with large print should be chosen for study. Dictionaries printed with very close and small type are very objectionable, as the looking out for the words fatigues and overstrains the eyes. Girls should avoid very fine work, especially in the evening, and more particularly when the material is coloured or black. The object upon which the eyes are employed should be held straight before them, as looking at it obliquely may easily induce squinting, and should likewise be at as great a distance as possible from the eyes ; for which purpose the table should be low, and so placed that the light may fall upon it either from above or from the side. It is also advantageous occasionally to change the position of the body, and to work sometimes sitting, sometimes standing, as at a desk for example. Occasional entire remission of labour, remaining for some time in the country, taking exercise, such as gymnastics, viewing verdant and mildly illuminated scenery, and employing the eyes frequently in looking at distant objects, are particularly to be recommended for sedentary and studious persons. For young ladies at this period

it is important that attention be paid to the proper circulation of the blood, and to the stomach and bowels, and that much exercise should be taken.

It is from neglect of these rules, that those affections of the eyes usually occur, to which the eye from youth upward has a great tendency, and which are moreover induced by many causes peculiar to the season of youth, namely, near-sightedness, and weakness of sight.

In order to be clearly understood upon the subject of near-sightedness, I must beg leave briefly to remind the reader of what has been explained more in detail at p. 21—23; namely, that of every object which is seen, an image is formed on the retina, or nervous membrane within the eye by means of the rays of light. In order that the object may be seen distinctly, the point at which the image is most accurately formed must fall exactly upon the retina: for it is only under this condition that a full and perfect impression can be produced upon it. If the rays of light are too much refracted, and made to converge too soon, the image falls short of the retina; if the refraction be too feeble, so that the convergence is too slowly effected, it falls beyond or behind it. In either case, the retina can have but a weak and imperfect impression of the image, and the object consequently is indistinctly seen. The first-mentioned condition of the eye, in which the image falls short of the retina, is named myopia, near-sightedness,

or over-refraction; the latter is named presbyopy, far-sightedness, or diminished refraction. (*See the Engraving.*)

In its normal state the eye possesses, by means of its activity, and power of accommodation, the wonderful faculty of seeing with equal distinctness, and almost at the same moment, objects which are near at hand, and those which are remote; and is able to perceive even very minute objects clearly and distinctly at a distance varying from fifteen to twenty inches: this distance is called *the point of distinct vision*. If this point be nearer to the eye than fifteen inches, the eyes in such case are myopic; if, on the contrary, the eyes require the object to be removed to a greater distance than twenty inches, they are presbyopic.

It is frequently the case that the point of distinct vision is not the same for each of the eyes, even in persons who enjoy good sight, and then the right eye is usually more perfect than the left,* if the difference has not been occasioned by the use of single glasses, or by the habit of viewing objects chiefly with one eye. Many persons actually do not know whether they have myopic or

* Mr. Wardrop (*Morbid Anatomy of the Human Eye*, Vol. II. p. 244. London, 1834) says: "In most people the right is stronger than the left eye;" and Mr. Lawrence, (*Treatise on the Diseases of the Eye*, p. 45. London, 1833) states: "In a considerable majority of instances, the right is the strong eye, or the one used for attentive vision."

presbyopic eyes, or whether there is any difference between the two eyes. They may ascertain the condition of the eyes by viewing any small object, first with both eyes together, and then with each eye separately, while the other is covered, and placing the object at various distances, till the point of distinct vision has been exactly found. The distance of this point measured from the eye will serve as a scale to determine precisely the existing state of vision, and the difference, if any exist, between the two eyes, and thus also the degree of myopy or presbyopy in either or both.*

Neither myopy nor presbyopy is an actual disease of the eyes, but only a relative condition of soundness; weakness of sight, on the contrary, is an actual disease of the sensitive part of the visual organ, or in other words, a functional disease. Here, though the eye is able to see objects clearly at the first moment, the perception soon becomes faint, confused, and indistinct. The eyes therefore are unable to sustain their due share of exertion. Though the necessary power of the sensitive part is in the first moment present, it is

* I have been informed by Mr. Ross, the Optician, of 33, Regent Street, Piccadilly, that on examining the sight of persons who apply to him for spectacles, he frequently finds a greater or less difference of sight in the two eyes. He mentioned to me an instance of a gentleman, for whom he recently made a pair of spectacles, in which the glass for the left eye was a convex of 16 inches focal length, while that for the right eye was a concave of No. 4.

not strong enough to last the requisite length of time; the sight in effect is weak. Weakness of sight occurs far less often in the earlier periods of life than is commonly supposed. Young persons, when their sight is not perfectly according to their wish, usually say that they have weak eyes; what they call weakness of sight, however, is either the first degree of myopy, or is the effect of a temporary pressure of blood towards the head, and especially towards the eyes; but this momentary weakness is easily removed, when strict attention is paid to the free circulation of the blood. Nevertheless there are instances of its occurrence in young persons, either from not sufficiently exercising, or from over-exerting the sight; from a continued afflux of blood to the head and eyes, or from the exhaustion consequent upon great loss of the fluids, &c.; and when produced by such causes, especially of the latter nature, the affection may in some instances, if neglected, become very serious. In all these cases recourse must be had to the assistance of a skilful practitioner.

Since true weakness of sight, as well as presbyopy, occurs generally at the latter period of life, I shall speak in a more detailed manner upon these subjects in the fifth Chapter of this work, and treat in this place only of myopy, as chiefly belonging to younger persons.

Pure myopy, as already stated, is not weakness of sight, but merely a relative condition of sound-

ness of the visual apparatus, which in this case refracts the rays of light in a greater degree than in the perfect eye. This too great refraction of the rays of light may result from the form of the eyeball, viz. from the too great convexity of the cornea—which is generally caused by a too large proportion of the aqueous humour; from over-convexity of the lenticular system; from the eye being less capable of adjusting and adapting itself to the various distances of objects; or lastly, from too great density of the transparent media.

The short-sighted person recognises even large objects at some distance only imperfectly, or perhaps not at all; while he is obliged to bring small objects within the distance of fifteen inches from his eye, sometimes as near as three or four inches, in order to see them well defined. In reading, he prefers a small type, which he peruses even in the twilight, or by moonlight, with more ease than other persons; he writes also a small hand. In endeavouring to distinguish objects at a distance he blinks, and partially closes the eyelids.

Myopy may be congenital, and in this case sometimes gives way in the course of time under judicious treatment, without the aid of medicine, when it is not hereditary in the family; it may arise also from diseases of the eye or of the whole body, in which cases it requires the early assistance of a medical practitioner; in the great majority of instances, however, it is acquired gradually, and may

be prevented by the strict observance of the rules laid down at the beginning of this Chapter. It occurs also in conjunction with weakness of sight.

The principal causes of myopy are the learning of arts, sciences, and trades, together with the excitement of the system arising from the activity of the circulation during the period of youth. Every thing, therefore, which tends to promote the pressure of the blood towards the head should be avoided, and attempts should be made to counteract this tendency by abstinence from heating drinks, and by the substitution of such as are of a cooling nature, by strict attention to diet and to the bowels; by washing the eyes with cold fresh spring water, by the application of cold water by means of a piece of linen to the neighbourhood of the eyes and to the forehead,—not however when overheated, and by the use of stimulating foot-baths. The first degree of myopy is generally occasioned by the bad custom of bringing objects too near to the eyes. The object, upon which the eyes are employed, should therefore always be removed as far as possible from them; occupation with very minute objects should be entirely abstained from for a time; exercise should be taken in the open air, and the eyes should be directed to distant objects, for which purpose the game of cricket, hockey, foot-ball, and field-sports are to be much recommended. If only one eye be myopic, let the sound eye be bound up, and the other diligently

exercised in viewing distant objects. If however no improvement is effected by the persevering observance of all these rules, and the sight is so much injured, that the business or occupations of the individual can no longer be attended to without fatiguing, or still further impairing the sight, recourse may be had to suitable, that is to say, neither too strong nor too weak, concave glasses; yet even this expedient should not be resorted to till absolutely necessary, and should be adopted rather at a somewhat late, than at too early a period.

It is necessary however to observe certain rules both in the selection and employment of these glasses,* since they may increase, or even generate the myopy, if they are used without having been properly selected; if they are not adopted at the right period; if they are used more often, or for a greater length of time than is requisite; or without any necessity at all, as is observed in so many instances, in which the misuse of an eye-glass arises merely from compliance with a pernicious fashion. To such followers of fashion the only advice to be given is, that they should entirely lay aside the eye-glass, absolutely refrain from occupation with minute objects, and exercise themselves very diligently in looking at distant objects, in order, if not already too late, to improve the

* Vide Chap. VI. Sect. 4.

sight; or they will have reason to lament, for their whole life, the misuse of this delicate organ.

It is very true that persons, whose eyes were without defect in their youth, and who have consequently enjoyed a good sight, generally become far-sighted in old age. This fact, however, by no means affords ground for young people, who are actually myopic, or who indulge in the abuse of concave glasses, to expect that they will lose the myopy in the course of time, and then see more distinctly at a distance. Myopy, when it has once commenced, is always more disposed to increase than to diminish. This is proved by the fact that the glass which the short-sighted person had accustomed himself to use at first, is afterwards usually exchanged for one of stronger power, not because the glass becomes deteriorated, but because the myopy has increased. Those persons only, who have neither too early, nor thoughtlessly, had recourse to concave glasses; who have not made use of glasses too strong in the first instance, nor afterwards exchanged them for stronger; who have used them but seldom, and only in cases of the utmost necessity; who have not been unremittingly occupied with small objects; and finally, whose mode of life has been in accordance with the precepts necessary for the preservation of the general health, and especially that of the eye:—such persons only may indulge the almost certain hope that they will in time lose the myopy, and

acquire a good sight, and in many cases they may even enjoy the benefit of not becoming presbyopic in old age.

Myopy shows itself almost exclusively at an early period of life, and is especially met with in such persons as are continually occupied with minute objects which are brought near to the eyes, or in studious persons, and artists; it is more rare among those whose business leads them out of doors, and who use their eyes in looking at distant objects. It occurs not unfrequently in persons among the higher classes of society, who, if they do not happen to recognise a remote object so quickly and clearly as another person, immediately have recourse to a concave glass to remedy this inconvenience. They gain their object by this means, it is true, but produce imperceptibly actual myopy. Mr. Ware furnishes us with conclusive evidence upon this point.* He inquired, for instance, of the surgeons of the three regiments of foot-guards, consisting of nearly 10,000 men; and he was informed that near-sightedness was almost unknown amongst them. At the Military School at Chelsea, where there were 1,300 children, near-sightedness had never been complained of among them, until Mr. Ware mentioned it, and then only three were found who experienced the least inconvenience from it. He pursued his inquiries at several

* Philosophical Transactions, Vol. CIII. p. 31. London 1813.

of the colleges of Oxford and Cambridge, and found near-sightedness very prevalent in these institutions. In one college of Oxford, where the Society consisted of 127 members, thirty-two either wore spectacles or used hand-glasses. It is not improbable, that some of these were induced to do so, solely because the practice was fashionable.

“When I first learned to read,” says Sir Charles Blagden,* “at the usual age of four or five years, I could see most distinctly, across a wide church, the contents of a table on which the Lord’s Prayer, and the Belief, were painted in suitably large letters. In a few years, that is, about the ninth or tenth of my age, being much addicted to books, I could no longer read what was painted on this table; but the degree of near-sightedness was then so small, that I found a watch-glass, though as a meniscus it made the rays diverge very little, sufficient to enable me to read the table as before. In a year or two more, the watch-glass would no longer serve my purpose; but being dissuaded from the use of a common concave glass, as likely to injure my sight, I suffered the inconvenience of a small degree of myopy, till I was more than thirty years of age. That inconvenience, however, gradually though slowly increasing all the time, at length became so grievous, that at two or three and thirty I determined to try a concave glass;

* Philosophical Transactions, Vol. CIII. p. 110. London 1811.

and then found, that the Nos. 2 and 3 were to me in the relation so well described by Mr. Ware; that is, I could see distant objects tolerably well with the former number, but still more accurately with the latter. After contenting myself a little time with No. 2, I laid it wholly aside for No. 3; and, in the course of a few more years, came to No. 5, at which point my eye has now been stationary between fifteen and twenty years. An earlier use of concave glasses would probably have made me more near-sighted, or would have brought on my present degree of myopy at an earlier period of life. If my friends had persuaded me to read and write with the book or paper always as far from my eye as I could see; or if I had occasionally intermitted study, and taken to field sports, or any employment which would have obliged me to look much at distant objects, it is very probable that I might not have been near-sighted at all."

It is here important to make mention of stays and other means of constraint which are intended to give a fine form or shape to the body. Apart from the consideration, that the form thereby aimed at is unnatural, and positively discordant with the ideal of beauty, tight lacing,—whereby the free communication between the chest and the abdomen is in a manner forcibly interrupted, and the functions of the various organs in both those cavities are to a great extent impeded,—exerts an in-

direct but highly injurious influence upon the eye itself, keeping its nerves and blood-vessels in a state of perpetual irritation and congestion. But all tight lacing, and pressure of the body, is particularly dangerous during the years while the female form is in the course of development; for the circulation being at this time very active, a free course ought to be allowed for the diffusion of the blood through the system, especially in the abdomen. The dress therefore at this period should be loose, much exercise should be taken in the open air, and all employment of the eyes upon minute and fine objects entirely abstained from.

Tight neck-cloths have a similar, but more directly injurious influence upon the eyes. The frequently excessive breadth of these articles of dress, by constraining the neck must naturally cause obstruction to the blood in the head; inasmuch as while less hindrance is offered to the ascent of the blood, on account of the deeper situation of the great arteries, its return to the heart is checked by the pressure exercised upon the veins, which lie more superficially. Such imprudent confinement of the neck, or of the body generally, may give occasion for the development of dangerous inflammation of the eyes, myopy, or actual weakness of sight; or may even lay the foundation, though the progress may be slow, and the disease may not manifest itself for years, of cataract, or of

amaurosis. All these sources of injury must be avoided, especially at the time of puberty.

An improper habit, which ought to be avoided in youth, is that of smoking tobacco. The smoke, especially that of cigars, is unpleasant and injurious to the eyes, and still more so when the stimulating property of the tobacco is increased by the pernicious admixture of pungent substances.* By the narcotic effect, even of the purest tobacco, upon the brain and nervous system, by the stimulus exerted upon the salivary glands, and by the consequent loss of fluid, weakness of sight may be easily induced. During the smoking, a great loss of saliva is unavoidable; which, in common with every other considerable loss of the fluids at the time of puberty, is very debilitating and prejudicial to the body in general, and to the eyes in particular.

* Vide Chap. VI. Sect. 5.

CHAPTER IV.

THE EYE IN MANHOOD.

IF the health of the body, and of the eye in particular, have been preserved unimpaired through the period of youth and puberty, the eyes at the time of manhood are found in their full strength and activity. It actually excites astonishment, when we consider the variety of labours, requiring immense expenditure of the power of sight, which many an individual has performed in the interval between his twentieth and fiftieth year, without detriment to his eyes.

But as both nourishment and exercise are necessary to the maintenance of the health and vigour of the body, so also, to preserve the strength of the faculty of sight, are light and exercise required by the eye. Light may be regarded as the proper food of the eye, for in an inferior degree of light the power of vision becomes gradually weaker, although on the other hand a too strong degree of light is not less prejudicial, inasmuch as it overstimulates the visual organ. That light may be beneficial to the sight, it is requisite not only that

its quantity should be duly regulated, but also that it be of suitable quality, and conveyed in a proper manner to the eye. Exercise, as the second condition requisite to the preservation of the sight, must be performed daily and methodically. By this means the eyes become so much more developed, and brought to so much greater perfection in one individual, than in another by whom they are but little exercised, that they not only perform their ordinary functions in the most perfect manner, but also acquire consummate skill in the perception of size, form, distance, &c. While the judicious employment of the eyes, with the necessary changes and relaxations, increases and strengthens the power of vision; their inactivity, on the contrary, induces indolence and weakness. On the other hand again, we must not exact too much from the eyes, as by over-exertion they become wearied, and worn out, as we observe to be the case in various classes and trades, among which moreover peculiar complaints of the eyes occur, as connected with certain occupations.

Though there do not exist any particular causes for diseases of the eye, which may be considered as peculiar to this period of life, still this organ, in common with the whole system, is liable to be affected by almost all the diseases to which mankind is subject. The number of complaints of the eye is accordingly very considerable. Affections purely local, or maladies originating and existing

solely in the eye, form only the smaller number of cases in manhood; for as the organ of sight stands in such inseparable connexion and intimate sympathy with the whole system, these complaints are in general occasioned, or are connected with, or may be kept up by some constitutional disease, either latent or apparent. The general diseases of the body, or such as usually manifest themselves in other organs, may accordingly either implicate, or entirely expend themselves upon the eye, and occasion therein a special disease. Such deviations of the system from the healthy state are: catarrh, rheumatism, gout; disorder of the abdominal organs, fullness of habit, pressure of blood towards the head, hæmorrhoids; chronic eruptions, open sores, swellings; irregularity of the periodical indisposition, child-bed, &c. The local diseases of the eye are chiefly such as are produced either by defective formation, external injuries, or contagion; or they are the sequelæ of preceding ophthalmic diseases. These again in turn may either involve the system in their sufferings, or may be peculiarly modified, aggravated, or kept up by some latent evil in the body.

Although the directions with regard to the prevention of these general deviations of the body from the healthy state do not strictly belong to this place, it will not be superfluous to give some rules on those constitutional disorders by which ophthalmic diseases are most frequently occasioned.

Persons who have a predisposition to catarrh, rheumatism, or gout, (those who have suffered in early life from struma are in general inclined to gout,) or who are actually labouring under either of these maladies, must carefully avoid all sudden changes of temperature, keen winds, damp and cold dwellings, and all exposure to cold and wet which occasions suppression of the cutaneous function. When the first symptoms of disease show themselves either in the body generally, or in the eye alone, the patient should observe a low and light diet, should wear flannel clothing, keep himself quiet and in a uniform temperature, should use warm drinks and take a warm bath, to restore the functions of the skin. Stimulating foot-baths and active aperients are also of great service. The local application of cold to the affected eye is very dangerous in all these cases, for although it may alleviate for the moment the inflammatory pains, the inflammation itself is always aggravated soon afterwards; the face and eyes therefore must never be washed with cold water. The sudden disappearance of an inveterate cold in the head, in consequence of washing with very cold water, has sometimes caused perfect blindness. The same consequence has been observed when an attack of gout suddenly ceases. In such cases, a person going to bed with good sight may rise blind.

Persons suffering under disorders of the abdominal organs, fulness of habit, or pressure of blood

towards the upper part of the body, should take care to avoid every kind of labour which requires great and long-continued exertion of the eyes, as well as a sedentary mode of life, impure air, overloading the stomach, and the use of fermented and spirituous liquors. The food should be plain and easy of digestion, taken rather in small quantities, and several times in the day, than at one hearty meal. The bowels should be kept regularly open, if necessary, by means of mild aperients. Daily exercise in the country, on foot or on horseback, should be used, and cheerful society frequented. In chronic disorders of the liver and abdominal organs, in gout, and in some cases of hæmorrhoidal complaints, the mineral waters of Carlsbad, used under the advice of a physician, are of great service ; and in fulness of habit and congestions, those of Marienbad are preferable. Since very serious diseases of the eyes may arise from interrupted or suppressed hæmorrhoids, every attention should be paid to prevent their suppression, especially at the time when they are flowing. When the eyes are affected, in consequence of this latter complaint, stimulating foot-baths, and applications of cold water in the manner already mentioned to the neighbourhood of the forehead, temples, and the eyes, are to be recommended, provided that the patient is not at the same time suffering under catarrh or rheumatism.

People who are afflicted with chronic eruptions,

open sores, ulcers, swellings of long standing, or perspiration of the feet, should be on their guard against wet and cold; as the occurrence of a violent cold not unfrequently causes the evil to recede and throw itself upon the eye, where it causes diseases most dangerous to the sight. They should likewise avoid the application of cold water to the eye, defend it from draughts of air, and be careful that the morbid discharge from the sore, or from any diseased membrane or part of the body, be not communicated by contact to the eye. They should keep the skin in the utmost state of cleanliness, and make use occasionally of tepid baths.

The complaints of the eyes, which occur at this period of life among the female sex, have a peculiar character, resulting from the physical constitution of the system in that sex. In the first place, females are subject to many inconveniences connected with the periodical indisposition. In many instances, and especially previous to its first occurrence, there is an increased afflux of blood towards the chest and head, attended with heat, redness, and heaviness of the eyes, together with a discharge of tears and intolerance of light. At this time, as well as at every recurrence of the period in question, rest should be granted to the eyes; they ought not to be exerted with reading or any fine needle-work; where great sensibility to light is present, they should be defended by a shade, and washed several times a-day with cold spring

water. If complaints of the eyes should arise from any irregularity in the period, medical assistance should be early sought.

Child-bed is also a season at which complaints of the eyes are apt to occur. As the body is always weakened by parturition, though its course may be perfectly regular, the chamber, during confinement, is very properly darkened; for light exercises a stimulus upon the senses, which ought to be avoided when the body is in a debilitated state. If there is any disturbance of the functions during the period of confinement, or if the mother is unable to suckle the child herself, let her avoid the slightest exertion of the eyes, all excitement of the feelings, and especially exposure to cold. Should complaints of the eyes occur from any of these causes, let the chest of the mother be kept warm by means of flannel or fur; at the commencement of the disorder let the milk be frequently drawn from the breast, if not by the child, by some other means, and let the action of the skin be promoted. Foot-baths also are to be recommended in cases where the complaint arises, at a subsequent period, from weaning the child.

Lastly, at the time when the change of life in females takes place, it is necessary that the greatest attention should be paid to the eye. The blood, which, owing to the suppression of the accustomed discharge, is as yet distributed irregularly through the body, is more apt, on account of the general

irritability which is present, to exercise a prejudicial influence upon the eye, which may be best counteracted by such means as tend to confirm the general health. If affections of the eyes, originating from this source, should make their appearance, let the mind and body be kept at rest; let the excess of the circulating fluid be attracted towards the lower part of the body; let the feet be kept warm; let general baths or stimulating foot-baths be used, and mustard poultices be applied to the calves of the legs; a light and well regulated diet being used at the same time, and care being taken that the bowels are regularly open. Let all exertion of the eyes, and all irritation from light, be avoided, and when there is no predisposition to catarrh or rheumatism, let cold water ablutions about the neighbourhood of the eyes, or the cold eye-bath, be used.

When the eye is affected by any such disease as arises from general disorders, it is of the first importance at its commencement that every occupation of the eyes should be discontinued, and that they should be defended against the impression of strong light. For the latter purpose, let the room be darkened to a certain degree, which may be best indicated by the feeling of the patient himself; or let a piece of fine linen, folded together several times, be fastened on the forehead by means of a riband bound round the head in such a manner, that it may hang down freely before the

eye; or let a shade be worn. The eye ought never to be bound up with a handkerchief, on account of the heat, irritation, and pressure thereby occasioned; rubbing and pressing the eyelids with the hands, or pinching them together, should be avoided; they should rather be gently closed as in a sleep. If secretions of mucus should take place, let the eyelids be cleansed with pure tepid milk and water by means of a sponge, and then let them be well and gently dried with a warm linen rag. Let the eyes be defended from impure air, and from draughts of air. Let the diet be light and moderate; let all spirituous liquors be abstained from; and let the bowels be kept open. But in all these cases, the local treatment alone is of no avail, since it is necessary to adopt measures to counteract the constitutional disease which is the cause of the evil, in order thoroughly to cure the affection of the eye. Let therefore every one, who would not willingly be guilty of neglect, make early application to an ophthalmic physician. I must particularly caution the reader against the use of all nostrums in these complaints of the eye; for by a single misapplication, the delicate organ of sight may be for ever disorganized and destroyed.

The intimate relation which subsists between the visual organ and the mind, has been noticed on many occasions in the first part of this treatise. Violent affections, passions, and agitation of the

feelings, must accordingly extend their injurious influence to the eye. Long-continued grief and care have for their consequence a diminution of the power of vision, and may even occasion amaurosis. Extreme terror likewise has sometimes induced blindness. Violent anger is an especial enemy to the faculty of sight. In these cases the principal remedial agents are: restoration of the feelings to a tranquil state, the maintenance of a cheerful frame of mind by the enlivening influence of society, music, recreations in the open air, and in pleasant parts of the country. Whatever diminishes the flow of blood towards the head, aperient medicines, foot-baths, and applications of cold water about the neighbourhood of the eyes are of great service.

As to the other general rules for this period of life which yet remain to be mentioned, they coincide for the most part with those which will be set forth in detail in the sixth chapter. Respecting *muscæ volitantes*, weakness of sight, and cataract, the reader is referred to the next chapter.

CHAPTER V.

THE EYE IN OLD AGE.

THE energy of the vital power, at this epoch, begins to decrease, and the regularity and harmonious co-operation of the system, and the functions of the organs gradually relax. It is observed of the eye in old age, that the earlier fire of the glance disappears; that as the power of the retina is diminished, the sight becomes blunted, and actually weak; and that as the secretion from the fine capillary vessels is more sparing, the membranes of the eye become attenuated and rigid, and the transparent media turbid, and reduced in volume.

The enjoyment of a degree of light judiciously regulated both as to quantity and quality, and methodical exercise of the eyes, are the principal means to be adopted by aged persons also for the preservation of their sight. Though it would be highly improper to make the same demands upon the sight as in earlier life, still this sense must not be left quite unexercised, as in either case the eyes would become very sensitive, and the sight still weaker; choice should be made therefore of

such occupations as are not fatiguing. Persons much advanced in life should entirely refrain from employing their eyes upon minute and fine objects; they should read large print, and, in particular, should take care to vary frequently their occupation, especially if the mind is much exerted at the same time. If the least degree of weariness is experienced, the eyes must on no account be longer exerted, but must desist from labour, and yield to repose in diminished light, or enjoy such relaxations as may recruit the sight, and strengthen it for new occupations. The light should be always mild, admitted in a judicious manner, and regulated according to the occupation. The reflection of light from white and shining bodies is particularly injurious to the eyes of old persons. Working by artificial light is much to be censured; but if this cannot be avoided, let the eyes on such occasions be occupied only with larger objects, and with writing rather than reading. They should be defended by a shade, and several wax-lights, or a lamp of appropriate construction* should be used. Exercise in the open air, and frequently looking upon green fields, or a landscape of subdued colouring, ought not to be omitted even by old persons, as by such means the eyes, in conjunction with the whole frame, become newly animated and recruited. A just proportion of sleep must be al-

* Vide Chap. VI. Sect. 2.

lowed to the eyes. If these organs have been economically used, properly taken care of, and never abused in earlier life, a sufficiently powerful sight may be enjoyed even to the most advanced age.

One of the most frequent concomitants of old age is presbyopy, or far-sightedness. Having already (p. 168) given a sufficient explanation of this state of vision, I have only here to continue my observations on the subject.

Presbyopy, as before stated, is not to be regarded as a disease, but is a relative condition of soundness of the eyes; here however the relation is the opposite to that in the case of myopy. Presbyopy is occasioned by the rays of light being less refracted than when the eye is perfect. This is owing either to the form of the eyeball, the cornea and lenticular system being in this case flatter; or to the nature of the transparent media, which on account of the more sparing supply of nourishment become diminished in density, and in quantity, whereby their power of refraction is lessened; or it may arise from want of power in the eye to accommodate itself to the different distances of objects. All these causes are generally present in the presbyopy of old age.

The presbyopic person recognises minute objects when near to him more or less imperfectly, and therefore seeks to remove them farther from his eye; distant objects, on the contrary, he sees as clearly as, and often better than the individual

who is endowed with a perfect organ. If he have previously laboured under a slight degree of myopy, this is in most cases entirely lost in old age, provided that he has paid great attention to the treatment of the eye, according to the rules given in the fourth chapter, and has not *misused* spectacles. As the presbyopic person requires that objects should be more strongly illuminated, that he may distinguish them clearly,—for this reason as well as that before mentioned,—he holds the book behind the light, when reading in the evening.

Presbyopy is sometimes, though rarely, congenital, or symptomatic of other diseases; but it may be acquired, and in the latter case is usually attached to certain classes of persons, such as game-keepers, artillery-men, and others whose occupation obliges them to look much towards distant objects. But in most cases it is a consequence of the advance of age, and therefore commences chiefly after middle life.

As those persons who are accustomed to exert their eyes very much, become the soonest and the most certainly presbyopic in old age, strict observance of the precepts I have mentioned in the former Chapters is at this time to be the more urgently recommended, in order that the inevitable evil may at least be retarded as long as possible. But for the entire prevention of presbyopy no rules can be given, neither does there exist for it any radical cure. Happily, however, we possess in convex

glasses a remedy which perfectly compensates for the inconvenience, and affords besides an advantage which no other glass possesses, viz. that of forming a clearer and more perfect image on the retina, so that by this means the object is more easily and distinctly perceived. The presbyopic person should begin to use convex glasses rather somewhat early than too late, that is to say, as soon as the least sign of the defect is observed, and should employ the greatest care and circumspection in the choice of suitable glasses.*

Weakness of sight, in a greater or less degree, will inevitably sooner or later be the lot of such persons as have neglected the necessary precautions in the previous use of the eyes; who have misused these organs; whose frames have been debilitated by many and severe diseases, by great loss of the fluids, or excesses of any kind. This is not to be confounded with that weakness of sight which is apt to remain for some time after serious diseases of the eyes, but gives way of itself under the observance of proper rules for the eye.

True weakness of sight is a disease resulting from a diminution of strength in the sensitive part of the eye, and most frequently in the retina. The power of vision is not wanting, but is easily wearied and exhausted; it is deficient in energy and continuance of action. At the first moment

* Vide Chap. VI. Sect. 4.

the eye recognises either near or remote objects with perfect clearness and sharpness of outline ; but on continuing to look at them, they soon appear indistinct, faint, and confused. In reading for any length of time, the letters seem to dance and to become confused, or almost entirely disappear for a moment. The eye is absolutely unable to bear exertion ; it is easily overstrained, becomes weary and dull. With these symptoms is associated an oppressive pain in the eye, and in the head ; tears begin to be discharged, the upper eyelid becomes heavy, and the eye cannot be kept open. After the eye has been closed for a short time, and allowed to remain at rest, all these symptoms entirely disappear ; it is then again just as strong as before, only however for the same length of time. Eyes thus affected feel more inconvenience in looking at near than at distant objects ; the latter is often agreeable to them. Looking out of doors is beneficial to them ; they endure it for a longer period, and it is seldom succeeded by weariness. Weakness of sight may occur in conjunction with presbyopy, and with certain false visual sensations, which are called in common language *motes*, and technically *muscæ volitantes*.

These illusions, or *muscæ volitantes*, present the greatest variety as to their form, colour, and duration. Sometimes they are round or angular points or spots, sometimes rings or stripes like those of snakes, sometimes they appear as network

or as nebulæ ; sometimes they are clear and transparent, at other times dark and opaque ; at one time they remain stationary, at another they move, or disappear, and again appear from time to time. They are usually most perceptible on looking upon white surfaces, or on very clear days ; in the twilight they mostly disappear. They occasion considerable annoyance to the person troubled with them, inasmuch as they often greatly disturb the sight. On this account, not being thoroughly acquainted with the nature of the affection, the patient feels the greatest anxiety, imagining these illusive phenomena to be the sure fore-runners of *gutta serena* ; frequently indeed his mind is so firmly impressed with this opinion, that the arguments of his friends, and even the representations of the most experienced physicians, are scarcely able to persuade him to the contrary. The *muscæ volitantes* are by no means so dangerous as has been supposed, and the reader may be assured that in the majority of instances the evil is perfectly free from danger. Though it is true they are difficult to remove, when they have once reached a certain extent, there is no reason, if the general health is not impaired, to apprehend the loss of sight, as this faculty may be preserved even under the existence of the evil to the most advanced age. In the course of time the individual becomes accustomed to them, and they therefore occasion less inconvenience. They are only to be regarded as precursors of

more serious diseases of the eye, when they are accompanied with several other symptoms, which depend upon the general state of health, and the constitution of the individual, and upon an actual defect in the sensitive part of the eye. The *muscæ volitantes* are not unlike those optical illusions, which arise even in perfectly sound eyes on looking for some moments at the sun, or at a very bright fire, and then directing them to a less bright object; these illusions however soon disappear, when the eyes are closed, and allowed to rest for a short time.

Muscæ volitantes may occur in young persons, especially about the time of puberty; generally however they belong to later years. They appear either independently of any other ophthalmic disease, or simultaneously with weakness of sight, or amaurosis. They may likewise be attributed to certain occupations of life. To discover the true cause of these illusive phenomena in every case is in fact very difficult. They may arise from the lacrymal humour being too copiously secreted, and thus occasioning an irregular refraction of the rays of light; or from flakes of mucus, which are drawn over the cornea by every movement of the eyelids. Secondly, they may be owing to partial opacity of the cornea, or the other transparent media; or to debility, irregular action, or partial paralysis of the nervous membrane of the eye. There is even reason to believe that

muscæ volitantes may be occasioned by infusoria, generated and moving in the aqueous humour of the eye. Thirdly, their cause may be constitutional, and may exist either in functional derangement of the nervous system or of the abdominal organs, which through the medium of the sympathetic nerves extends its influence to the organ of sight, as we observe in hypochondriacal, and in hysterical persons; or in irregular circulation and pressure of the blood towards the head and eyes, as occasioned, for instance, by interrupted hæmorrhoids; or, lastly, in general debility.

From the variety of causes to which *muscæ volitantes* may be attributed, nothing is to be more strongly recommended for their prevention, than the strict observance of such rules as tend to preserve the general health of the body. But when these phenomena have once manifested themselves, the patient should endeavour by every means in his power to ascertain the immediate exciting cause. In this inquiry must be taken into consideration the general state of health; the effect produced upon the organs of digestion and the whole system by the different articles of food and drink; the mode in which the body, and especially the eyes are occupied; and, lastly, the influence which light has upon the eye. Whoever attends closely to these particulars will find that the evil generally proceeds from some one or other of the above-mentioned causes, viz. the

degree of light, the kind of occupation, the diet, or manner of living. Having thus observed upon what occasions they usually present themselves,—for instance, after the use of some particular kind of food, or of spirituous liquors,—the patient may, by avoiding the cause, greatly mitigate the complaint, and in some cases indeed entirely get rid of it, provided it does not arise from a serious defect in the sensitive part of the eye, or from any chronic disease of the body. It may be mentioned that the eyes should not be over-exerted, and that they should be kept perfectly clean. Care must be taken to provide a mild and suitable light for every occupation. Excitement of the brain, especially long-continued study, and all violent emotions are to be avoided. Great attention must always be paid to the state of the stomach and bowels. Residence in the country, exercise in wholesome air, indulging the eye upon verdant scenery, and the use of tepid, or still better, of cold baths, are highly to be recommended. Where there is pressure of blood towards the head, bodily exertion must be abstained from, the feet must be kept warm, a stimulating foot-bath with some mustard powder should be used occasionally, and some cooling aperient medicine, such as Epsom salts, should be taken.

The following local remedies employed several times in the day, and persevered in, are highly serviceable against *muscæ volitantes*, when they have

their origin in irregularity, especially in debility of the nervous system of the eye. Let cold spring water be applied to the neighbourhood of the eyes, by means of a piece of linen folded and laid upon the parts, or by means of an eye-bath, provided that the individual is not at the time labouring under catarrh or rheumatism. Let six or eight drops of oil of peppermint, or oil of rosemary, be rubbed between the palms of the hands, and let the hands then be held at some little distance before the eyes, till the oil is entirely evaporated. Let strengthening, spirituous applications, such as diluted Eau de Cologne, red wine and water, brandy and water, or diluted Peruvian Balsam be rubbed over the eyelids and the surrounding parts.

The same mode of treatment which has been recommended for the prevention and cure of *muscæ volitantes* is to be pursued also for the prevention of weakness of sight, and for its cure in its earliest stage. The more carefully the rules for the general health and for the eye are observed, the more quickly and certainly will a favourable result be obtained. If, however, instead of giving way under the observance of such rules, the weakness of sight or the *muscæ volitantes* increase, the cause lies more deeply concealed, either in the eye, or in some other part of the system, and can only be detected by an experienced practitioner. In young persons, who are otherwise healthy, the evil is in most instances removed without

great difficulty by a judicious plan of medical treatment, and even in advanced age, where no unfavourable counteracting circumstances are present, its progress may at least be checked. In cases where there has been excessive loss of the fluids of the body; in general debility; and in irregularity of the nervous system, of the functions of the abdominal organs, or of the circulation of the blood, medical assistance is indispensable. If this assistance be not soon resorted to, the retina may begin to suffer actual injury, and then a state of impaired vision ensues, which is termed amblyopy.

In amblyopy the recognition of objects, even from the first moment, and at all distances, is indistinct, imperfect, and faint. Here the sensitive part of the organ of sight is not only deficient in strength, and in the power of continued action, as is the case in weakness of sight, but its capability of receiving visual impressions exists in a positively minor degree. If at length it becomes quite impossible to recognise small objects; if of larger objects only the principal outlines can be distinguished, or only light from dark, and the power of vision is almost, or entirely gone; this state is named amaurosis, or gutta serena. Amblyopy and amaurosis are the same as to their nature, and only mark two different degrees of a most serious disease. Although perfect amaurosis is almost always preceded by amblyopy, and the latter by weakness of sight, it may, for the satis-

faction of all persons who suffer under weakness of sight, be confidently affirmed—and daily experience proves the truth of the assertion,—that the weakness of sight in general remains stationary at the point which it has reached, if strict attention is paid to the general health, and the particular rules prescribed for the treatment of *muscæ volitantes* are carefully observed, and that amblyopy follows only in very rare instances. Amaurosis follows far more readily after amblyopy, when this has once occurred, than the latter after weakness of sight. In these disorders of vision, the eye does not exhibit external signs of disease; but the look, inasmuch as it depends upon the movement and direction of the eye, is somewhat changed in the higher stage of amblyopy, and in amaurosis, and the iris frequently loses the power of contraction and expansion. The patient appears to seek the light with his eyes, and accordingly carries his head quite erect; his eyes are often directed straight towards the brightest light, and even towards the sun. He sees best in a very strong light.

Amblyopy and amaurosis, which may certainly be classed among the most important and obstinate diseases of the eye, were regarded in earlier times as incurable; this however is not the case in all instances. By suitable treatment, and punctual observance of the directions of an ophthalmic physician, the cure is often effected; but this depends entirely upon the cause and duration of the dis-

ease. If the patient seeks proper assistance in time; if he can avoid the exciting causes,—which is often very difficult, when these are connected with sorrow, grief, or care; if his frame is not too much debilitated, either by loss of the fluids, by severe diseases, or by old age; and if circumstances are not in other respects unfavourable: a skilful practitioner often succeeds in removing the evil, or at least in preventing its further development. I urgently caution all persons against the use of nostrums which are recommended and sold even by oculists,—not only because during their employment the time is suffered to elapse, in which proper medical assistance might avail, but because the disease is often so much aggravated by such applications, that the complaint is no longer to be controlled, and perfect blindness ensues.

It is known from experience that eyes with brown or dark-coloured iris are more inclined to this disease, than those in which the iris is of a light blue or grey colour. There is, moreover, among the members of some families an hereditary tendency to this disease. In such cases it usually manifests itself between the fortieth and fiftieth year of their age. Where such predisposition exists, trivial exciting causes and neglect of timely professional aid are sufficient to produce the development of the disease. Upon close inquiry, it is usually found that several causes have combined to produce this serious disease of the retina. No

determinate plan therefore can be prescribed for its prevention, yet it will not be superfluous briefly to call attention to such causes of amaurosis as we are able to avoid, or at least to counteract in time, viz. over-exertion of sight, while employed upon minute, shining, or glittering objects, in too strong, too weak, or unsuitable light; prosecution of labour during hours which should be allotted to sleep, especially when the mind and eyes are occupied at the same time; deficient exercise of the eyes, and long residence in dark places; exhaustion of the body occasioned by chronic diarrhoea, by prolonged suckling, and all excessive loss of the fluids, by continued grief, and the like; continued determination of blood towards the head and eyes, arising either from direct or indirect causes, such as exciting passions, anger, coup-de-soleil, violent exertion of the body, occupations which require continued stooping, errors in diet, and especially the abuse of spirituous liquors; retrocession of eruptive diseases, suppressed discharges of blood, pus, or perspiration, especially of perspiration of the feet; slowness of bowels, obstructions of the abdominal organs, gastric and intestinal irritation, a bilious habit, worms, the continued use of indigestible food; puerperal, intermittent and typhus fever; rheumatism; gout; scrofula; tabes dorsalis; spasms; hypochondriasis; hysteria; and, lastly, contusions and injuries either of the head, or of the more important parts of the eye.

There are some other peculiar conditions of vision, occasioned either by irregular action, or partial paralysis of the retina, which, as they require medical aid, need only be mentioned in this place; they are night-blindness, day-blindness, double vision, and half-vision, photopsia, and other false sensations of sight of various kinds.

The following diseases of the eye have their seat not in the sensitive part of this organ, but in the refractive media, since they result from diminished transparency of these media. One of the most frequently occurring disorders of this class is cataract.

The pupil of an eye affected with cataract no longer presents a clear black appearance as in the healthy state, but is turbid, and of a grey colour, inclining either to white or yellow. The look is essentially different from that of an eye affected with amaurosis. An individual labouring under amaurosis seeks, as it were, the light with his eyes, and accordingly bends his head somewhat backwards as he walks along; a person suffering under cataract, on the contrary, endeavours to keep the light away from his eyes, and therefore carries his head inclined somewhat forwards, and moreover shades the eye by contracting the brows and lids, while the eye itself is directed downwards. He sees better when the day is cloudy, and towards evening, as also when the light is thrown more upon the object than upon his eye; for this rea-

son he places himself with his back towards the light or window, or shades the eye with his hand, while looking upon an object. Objects at all distances appear to him as if viewed through mist, and their outlines are not well defined.

The proximate cause of cataract is always to be found in an abnormal state of nutrition either of the whole, or of a part of the lenticular system (See p. 7). This abnormal state is either deficiency or excess of nutrition. In the former case, the lens shrinks, is in some measure dried up, and thus naturally loses its transparency. The persons most liable to be affected with this species of cataract are the aged, those who have over-exerted their eyes either in too strong or too weak a degree of light, who have suffered great loss of the fluids, or who labour under general debility; it may likewise be the consequence of violent blows on the eye, or of fractures of the skull:—these causes inducing, if we may so speak, premature old age of the lens. This kind of cataract is sometimes met with as congenital, if the development of the lens is checked at some period before birth, in which case it never afterwards acquires a perfect organization or formation. The second species of cataract is that in which the nutrition of the lenticular system is in excess. Here a slow process of inflammation takes place in the capsule of the lens, terminating in the effusion of coagulable lymph, and thus in opacity of the capsule, or of the lens itself. This species

may originate from rheumatic affections, irregular gout, irregularities of the functions of the abdominal organs, suppression of cutaneous eruptions, or of perspiration of the feet, or from the sudden dispersion of open sores, ulcers, or tumours of long standing. It may arise, further, from an obstinate congestive state of the head and eyes; from the excessive and continued use of strong, spirituous or fermented liquors, as well as of new wines; from violent inflammations of the eyeball, among which may be mentioned the ophthalmia of new-born children; and, lastly, from external injuries of the eyeball when improperly treated.

There are some families whose members are usually attacked by this kind of cataract about the same period of life; this species, therefore, or at least the predisposition to it, may be termed hereditary. The cause is generally gout, which in these persons manifests itself in the eye as cataract, just as in others it appears in the feet in the form of podagra. In some cases it may be from the occurrence of premature old age of the lens, though the bodily frame is still in full vigour.

By avoiding all sources of injury to the eye, and by observing such a temperate mode of life as may preserve the body long in a vigorous state, the occurrence of the first species of cataract, though it will not in all cases be prevented, will certainly be delayed till a later period than under an opposite course. It is not to be cured by medicinal

remedies ; being the result of old age, it can only be removed from the eye by an operation. For the prevention of the second kind of cataract, much may be contributed by the observance of a strict regimen with reference to the body in general, and to the eye in particular, and by attention to the rules given in the fourth Chapter. There is no doubt that some cases of the second kind of cataract may be cured by medical treatment, if the formation is not very far advanced, that is to say, when the effusion of lymph in the lenticular system is merely a symptom of inflammation, and not its termination ; and if circumstances are in other respects so far favourable, that the ophthalmic physician may have a fair chance of success. But if the cataract is already in an advanced stage of formation, it resists even the most judicious remedies. When, therefore, the cure is no longer to be expected from medical treatment, all counter-irritants, such as blisters behind the ears, issues at the arms, &c., which the patient sometimes makes use of in the hope of dispersing the cataract, are not only useless, but even prejudicial. For by such means the perfect development or ripening of the cataract is delayed, and thus the period for an operation, by which sight might be restored, is still farther retarded.

It is quite beyond a doubt, that by the operation for cataract, when it is undertaken under favourable circumstances, and is well performed,

vision may be entirely restored. The operation besides is not so painful, as the patient is beforehand apt to imagine. This assertion may be verified by inquiring of such persons as have been successfully operated upon. But the success of the operation depends very much on the conduct of the patient, both during and after its performance. He must submit to the operation calmly and without fear, and with confidence in the ophthalmic surgeon; during its performance his demeanour must be free from anxiety, steady, and collected; and in the subsequent treatment, all the precepts and injunctions of the medical attendant must be punctually and strictly observed. These points on the part of the patient are indispensable to success in the operation, and to the attainment of the desired result, and they are well worth the trouble of attention, since an operation is the only means by which the enjoyment of a good sight can be restored to persons afflicted with developed cataract.

The cataract, or opaque lens, is removed by the operation from the axis of vision. But as the crystalline lens is the body by which the rays of light are most refracted in the eye, it is necessary that its loss should be compensated to that organ by the employment of an artificial lens, in order that distinct vision may be produced. The person who has undergone the operation must consequently make use of cataract-glasses. With respect to the selection and use of such glasses, I

must beg to refer the reader to the section on eyeglasses in the following Chapter.

In the same manner as the crystalline lens in cataract, the other refractive media of the eye may also lose their transparency by an altered process of nutrition. Opacities of the vitreous body are very dangerous to the sight, and their cure very problematical. Opacity of the aqueous humour is generally the consequence of inflammation of the iris. Opacities and specks of the cornea obstruct the sight more or less according to their size; they may be cured while of recent date, but those of long standing are very obstinate, and frequently incurable. In aged persons an opacity of a white or yellowish colour, known by the name of *arcus senilis*, is not unfrequently formed on the margin of the cornea, extending sometimes entirely, sometimes only in part, through the circumference, and forming a ring more or less complete. This ring is always very narrow, and never becomes of sufficient breadth to offer the least disturbance to the sight. It is in all cases merely the result of old age, and therefore incurable.

Eversion and inversion of the eyelids are in advanced age frequently the consequence of relaxation, or of morbid contraction of the membrane which covers them. The inversion of the eyelids is so far dangerous, that it may easily occasion inflammation of the eye and opacity of the cornea. Several other affections of the eyes, which are apt

to occur in old age, might here be noticed, but this would be of no essential service, as in all such cases recourse must be had to professional aid. With respect to the general rules proper to be adopted at this period, I invite the attention of the reader to the following Chapter.

While we endeavour to retard as long as possible the advance of the infirmities of old age by a regular and rational mode of life, we may also, by proper management of the eye, enjoy the benefits resulting from the use of the noblest of our senses to the most advanced age.

CHAPTER VI.

GENERAL REGIMEN WITH REFERENCE TO THE EYE.

SECTION I.—*Management of the Body.*

A PERFECTLY healthy eye can exist only in a healthy body; whatever therefore tends to promote the general health, acts beneficially upon the eye.

The frequent enjoyment of free and wholesome air, and moderate daily exercise, are two of the principal conditions requisite to the maintenance of the health and vigour of the eye. For this purpose, where it is possible, let the most pleasant part of the day be chosen, after the morning mists are dispersed, and in the summer time that part, in which there is least likelihood of being overheated, and taking cold. Let verdant spots be resorted to, by looking upon which the eye is much strengthened, and where it is also secure from the dust, especially that of mac-adamised roads; let the interior of the town at least be avoided, where one is subject to the additional inconvenience of draughts of air through the streets.

Residence in the country, field sports, and traveling during the fine season, are much to be recommended. After exercise and exertion of the body, the necessary portion of repose should be allowed. Persons who sit with the abdomen pressed together, with the body or head bent forward, or who are generally sedentary, and those who remain for a long-continued time in rooms that are dark, or impregnated with unwholesome air, ought to pay much attention to these rules.

Careful attention to the skin is indispensable. The whole body ought to be washed with tepid or cool water, at least several times in the week, or baths should be used; shower-baths and swimming-baths are very strengthening. Washing the face with cold water, when it perspires, is extremely dangerous; and as, on waking in the morning, it is usually moistened with perspiration, it ought not to be washed immediately upon rising, but some time afterwards, with water of a temperature suited to the degree of irritability of the eye, and which contains no earthy or other foreign ingredients. Cutting the hair short is much to be reprehended. When the head is bald, it is advisable to wear a wig; this, however, may be injurious, if the wig be made in such a manner as to check evaporation from the head. Those persons, whose feet are apt to perspire, should take care to keep them warm, that the perspiration may not be suddenly interrupted, since the most obstinate diseases of the

eyes, and even blindness, may arise from this source.

The close sympathy which subsists between the abdominal organs and the organ of sight, renders temperate living necessary to prevent complaints of the eye. It is better to take food in small quantities, and several times during the day, than to eat much at once ; late suppers should never be taken. The food should be such as is easily digestible, nutritious, and not too much seasoned. It is not advisable to go to work immediately after the meal ; moderate exercise, or rest in a horizontal position, should be taken. Moderation should be observed in the use of all spirituous liquors ; a slight redness of the eyes, and a sinking of the upper lid—resulting from a kind of paralysis of its proper muscle,—which occur after every excessive indulgence of this nature, are sufficient indications of their prejudicial effect upon this organ. Ale should be used cautiously ; a glass of good porter is more to be recommended. All persons suffering under liver-complaints, which are the source of a great number of diseases of the eye, ought to pay the utmost attention to diet. The bowels should be kept regularly open ; this may be generally effected by a proper regulation of diet, but the frequent use of blue pills and black draughts, or the like, so often resorted to without any necessity, is very much to be censured. All pressing at stool should be refrained from, as this always

forces the blood towards the head. Early or excessive indulgence of the passions has a most debilitating and injurious influence upon the eyes.

The intimate connexion between the organ of sight and the brain forbids excessive exercise of the eyes during profound thought or long-continued exertions of the mind. Care should be taken therefore to procure a change of occupations, and occasional rest and recreation. Terror, vexation, anger, grief, and care, have an injurious influence upon the eyes, which is increased when these emotions of the mind last for some time, are repeatedly excited, or when they occasion frequent weeping. Nervous persons ought to be very attentive to every thing which affects their nervous system; for whatever excites or depresses this system too much, shows its unfavourable consequences upon the eye. Too much sleep weakens the eye, too little sleep, especially sitting up at night, is still more prejudicial; the hours allotted to sleep should be always proportioned to the exertions of the day.

An equal circulation of the blood throughout the whole body is of the greatest importance for the preservation of the healthy state of the eyes. This object is best attained by exercise out of doors, proper attention to the stomach and bowels, temperance in the use of spirituous liquors, avoidance of all agitation of mind or body, and by wearing proper clothing. Stays, and tight trowsers occa-

sion a congestive state of the upper parts of the body; tight neck-cloths prevent the return of the blood to the heart: all these articles of dress therefore are prejudicial to the eyes, when they confine the body too much. In order not to disturb the free course of the circulation, the clothing should rather be too loose than too tight; the dress should moreover be adapted to the season of the year, to the weather, and to the occupation,—in respect to the latter for the purpose of allowing the body and limbs to move freely. The covering of the head should be light, and such as may afford a sufficient shade to the eyes; the clothing of the feet should be warm and easy.

SECTION II.—*Adaptation of Light to the Eye.*

Light, being the proper food and element of the organ of vision, supports and strengthens the sight, when it is well regulated and properly used. Excess or deficiency, abrupt changes in the quantity or quality, and an unequal distribution of it, are prejudicial.

Though Nature has given to the iris the property of moderating the quantity of light, in the manner of a blind, by means of its motions, this property has certain limits. In strong light, the pupil spontaneously contracts itself, and thus, it is true, admits only a smaller quantity of light; but this being still

too intense, the eye is irritated by it, and, if this happen frequently and for a long-continued time, becomes over-excited, and indirectly weakened. The reader need only be reminded, that by looking directly at the sun, we feel blinded as it were for a few moments. In strong light, persons whose sight is weak place their hand involuntarily before their eyes, as a screen to keep off the irritation of the light. This ought to be regarded as a hint from Nature, that they should always make use of a shade in any degree of light which is hurtful to the eyes. The shade should be of light texture, affording sufficient protection to the eyes, of a green colour, somewhat transparent, and not bright on the inner surface, in order that the light may not be reflected. Ladies' bonnets, when the front is lined with white, yellow, or red silk, especially when this is bright and shining, must be injurious on account of the reflection of light. Bonnets with large fronts are very serviceable to weak eyes, but the lining should be green, blue, or grey, and not shining. Fans and parasols of dark colour are much to be recommended, as well as veils, provided they are at a proper distance from the face, of dark colour, uniformly transparent, and do not fall into folds before the eyes. Veils have besides the advantage of keeping off dust and keen wind from the eye.

All light reflected from white, shining, or polished surfaces, is extremely injurious to the sight.

Persons who have occasion to look long upon a bright flame, or are employed upon shining objects, and those who travel over dazzling roads, or in countries covered with sand or snow, should always make use of spectacles of a neutral tint. In travelling over the dazzling, sandy deserts of Africa, such spectacles ought always to be worn. In Egypt, and in Arabia, the moon-light has a very dangerous effect upon the sight; whoever sleeps in the open air in these countries should therefore always use the precaution to cover his face. As a source of great injury to the sight, may be here farther mentioned all reflectors, as they are termed, formed of plate-glass or polished metal, which are placed behind any burning flame, in order to reflect it strongly. A similar effect is experienced on a large scale in sea-voyages, when the light of the rising, or setting sun, or of the moon, is reflected from the vast surface of the waters. The following injurious habits, as they are apt to weaken the sight, ought to be avoided by persons who have weak eyes; namely, reading with a light placed between the eyes and the book; allowing the light of the fire to fall upon the latter; looking for a long time upon the fire, or upon the flame of the candle, while in deep thought; and at the decline of day, remaining for a long time with no other light than the fire in the room. In the theatre, the boxes nearest the stage should never be chosen, since the eyes

must inevitably be dazzled by the bright and strong light of the proscenium. The coloured artificial light, which is so frequently introduced in new operas, may be detrimental to the sight, both on account of the quantity and quality of the light.

Too weak light has an influence upon the eye almost as injurious as too strong light. By remaining frequently and for a long-continued time in darkness, or even in a dim and gloomy light, the retina becomes so sensitive that at length an ordinary degree of light cannot be at all endured. It is well known that in prisoners, who have been long kept in dark dungeons, the power of sight is sometimes nearly extinguished. They experience a sensation of pain when first restored to day-light, and are only able to endure it by degrees; in many cases an extraordinary sensitiveness of the retina has remained even for the whole life. It is erroneously supposed by some persons suffering from weakness of sight that they ought to remain constantly in a darkened room. This practice, so far from mitigating, actually aggravates the existing evil. Reading by moonlight greatly fatigues the sight, not only because the light is too feeble, but also because its quality is unsuitable; just as every other occupation with fine and delicate objects in weak light, or in the dusk of evening, is prejudicial. Weak eyes, when unemployed, are however refreshed and strengthened by occasional obscurity. It is advisable for

persons who are obliged to exert their eyes frequently and perseveringly, to darken the apartment a little, but in an equal degree throughout, by letting down the window-blinds during their leisure hours, while they are engaged, for instance, in conversation, at meals, &c.

Another cause of injury is the rapid alternation of different degrees of light. Occupation of any kind by a flickering light, or under a tree in an arbour, where, owing to the motion of the leaves, light and shadow fall alternately upon the object; remaining for a long time near half-closed Venetian blinds; or passing by a long railing or balustrade, when the sun is shining on the opposite side, is particularly unpleasant and offensive to the eyes. Quick transition from light to darkness, though hurtful to the sight, does not act so prejudicially as the sudden transition from profound darkness to clear light. In the latter case, the eye suffers a momentary blindness, and requires some time before it can see again clearly. Accordingly, when lights are brought into a room, after we have remained for a long time in the evening twilight, we should turn our eyes away from the flame, or close them for a short time. A sudden change is particularly injurious after the repose of the night. On waking in the morning, therefore, the bed-chamber should be so far darkened as not to be dissimilar to the light of dawn, and we ought not to repair immediately from this apartment to others

brightly illuminated by the sun. Strong bright light upon a dark ground has likewise an injurious effect; consequently, viewing the moon in a clear sky, the discharge of fireworks or of cannon, or watching the lightning, may be hurtful to the eyes; in storms during the night, therefore, it is always better to have a light brought into the room. In kindling a light in the dark, the eye should be turned away from the point of the match from whence the flame bursts forth.

The quality of light is no less deserving of our attention. Certain bodies (as has been shown at page 18,) possess the property of decomposing light, and variously modifying it, from whence their different colours originate. The light reflected to the eye therefore from coloured bodies presents a great relative difference as to quality, and exercises an action upon the retina corresponding to the mixture of the rays. White may be considered as the representative of light, and white bodies, especially when they are illuminated by the sun, reflecting, nearly in the same manner as self-luminous bodies, all the light to the organ of vision, excite the full and entire activity of the retina and optic nerve. The primitive colours differ from each other in the demand which they make on the activity of the nervous membrane. If we would represent the degree of their effect in numerical proportion, this might be done, though not with mathematical accuracy, somewhat in the

following manner:—White, as perfect light, would excite the entire activity; yellow, as most nearly related to white, would excite three-fourths; red, one-half; and blue, as standing nearest to black, only one-fourth. The intervening colours result from the mixture of the primitive colours, and their effect on the eye will therefore correspond to the proportions of this mixture; for example, orange would excite five-eighths of the activity of the retina, and so on with the rest. These colours are milder in their effect than the primitive colours of which they are composed; but the mildest and softest is that of grey, because the light being here not decomposed, grey may be regarded as merely a mixture of white and black, or as analogous to shade.

Hence the rules to be observed respecting the quality of light are self-evident. All bright colours, especially when they stand in strong contrast with each other, and are moreover shining, occasion a painful sensation in the eyes, and endanger the sight. Nature gives us a hint as to the colour which those objects that we most frequently have occasion to look upon, should present; for the garment she wears is green, and her canopy is blue,—colours which are beneficial to the eyes, and only make a slight demand upon the power of vision. We cannot, it is true, always follow this hint, but where the colouring of things around us depends on our own will, we ought to pay more regard to our

sight in the choice of colours, especially if the eyes are already weak. To the regulations proper for dwelling-houses and apartments I shall recur at the end of this section, and only mention here some causes of injury of the same nature as those now under discussion, which occur very frequently in large towns. These are, to wit, street-lamps with yellow, vermilion, or other coloured glasses, panes of glass of the same kind in windows, and the large bottles filled with various-coloured fluids in the windows of certain shops, when the gas-flame is immediately behind them. This kind of light is not only dazzling to the eyes in the darkness of night, but also doubly injurious on account of the strong contrast of colours. If these objects by their strong glare of light occasion an unpleasant, painful feeling in perfectly sound eyes, persons whose sight is already weak must be the more careful in passing to turn their eyes away.

Having thus far inquired into the circumstances under which light may be injurious to the organ of vision, it remains to speak of its properties when judiciously regulated.

That kind and degree of light which approaches nearest to the clear day-light without sunshine, and is besides quite uniform, always produces a sensation beneficial to the eyes. The most pleasant light is that which enters the apartment from above; horizontal rays are unpleasant, and those which come from beneath offensive. The window

blinds should never be more than half let down, since if they are further lowered, the room only receives light from beneath; it would however be preferable that the lower part of the window were darkened, and the upper part left quite free for the entrance of the light. The nearer the furniture and decorations of the room approach to a white colour, the less light is required, and *vice versa*. The degree of light must be suited to the minuteness of the object with which we are occupied. All artificial is weaker than natural light, and always contains some mixture of colours. When candles are used, several at a time, or two at least, ought always to be burned. They ought not to be placed far apart, and the flame should be above the level of the eye. The person occupied should place them directly before him, or when writing, somewhat to the left side. But candles have always these inconveniences: that the least draught of air causes them to flicker; that in the frequent snuffing, which tallow-candles at least require, one is obliged to look directly upon the flame; and that if the candlestick is not furnished with any contrivance for elevating them when they burn down, they send the rays horizontally, or from beneath to the eye. The use of lamps, therefore, is preferable to that of candles, as they are not attended with the inconveniences just mentioned. But as the flame of lamps has a greater intensity, we must avoid looking upon it. The principal requisites in a

properly constructed lamp are: that the flame be sufficiently elevated above the eye; that it illuminate the table and the apartment uniformly; and that the surface of the shaft be not polished, or shining, as is usually the case. Lamp-shades that are perfectly opaque, and therefore throw down a strong light upon a circumscribed spot round the lamp, while the rest of the apartment remains in darkness, are objectionable on account of the injury to the eye occasioned by abrupt transitions from dazzling light to comparative darkness. For ordinary use, lamp-shades of ground or milk-white glass are the best, but they should not have any perfectly transparent ornaments cut upon them, through which the flame itself may be seen. For working or study lamps, a shade formed of a double layer of gauze drawn over a wire frame, white on the inner, and green on the outer surface, is the most appropriate. The oil which is burned must be perfectly pure, that it may give a clear light, and emit no smoke. Among all kinds of light, that of wax-candles, when in sufficient number, or of gas, is undoubtedly the best; since it approaches nearest to the light of day, is the most free from mixture of colours, and by reason of its great intensity diffuses itself the most widely and equably. But the apparatus for conducting the gas must be so contrived, that the gas may flow equally, and not burn in a flickering manner, at one moment brightly, and at another dimly.

Lastly, every flame should be surrounded with a proper shade, for with all artificial light one of the principal rules to be observed is, that there be a suitable contrivance to prevent the flame from meeting the eyes,—which is the more necessary, the greater the intensity of the flame. If this rule be attended to, there can never be too great a number of flames, for according to experiments made by M. Pictet, one ray of the light of the sun has an intensity 12,000 times greater than a ray of a common wax-candle.

We come now to speak of the precautions and arrangements most necessary to be adopted respecting dwelling-houses and apartments, in reference to the preservation of sight.

Where circumstances permit, choice should be made of a house or apartment for the ordinary habitation, situated neither directly towards the east, nor towards the south, nor in a narrow street, and from whence a view may be obtained, if possible, of some green spot of ground, or which may at least have an open space before it. Houses fronting the sea-shore are ill suited to persons whose sight is weak, on account of the dazzling effect produced by the reflection of the sun from the vast expanse of water. If one is compelled to reside in the interior of the town, it is necessary to see that the height of the houses in the street, where the habitation is chosen, is in due proportion to the breadth of the street. The

dwelling should not be opposite to any dazzling, or bright coloured surface, such as a white wall. It is hardly necessary to add, that it must of course be dry, free from draughts, and that there should not be in the neighbourhood any great sources of smoke, or of marshy or other exhalations which may render the atmosphere unwholesome.

It would be useless to speak of drawing-rooms and saloons, as they are always arranged and decorated according to the wealth and luxury of the owner, or in compliance with the prevailing taste and fashion, and as we do not constantly occupy them, their arrangement is not of so much importance in the point of view we are now taking; but those rooms which are ordinarily inhabited should be properly arranged. The number and size of the windows ought to be regulated according to the quarter of the heavens which they face, and according to the size of the room, which should be spacious, and from about ten to twelve feet in height, in order to light it properly. Windows which descend to the level of the floor may occasion injury to the eyes, from the light entering in too great proportion from beneath. Coloured panes of glass are quite inadmissible; those of plain plate-glass are the best. The most proper contrivance for window-blinds is that by which they can be drawn from beneath upwards, so that the room may be always lighted from above. Venetian blinds are injurious, owing to the interrupted light which

they admit. Papers of bright or shining colours on the walls are highly prejudicial; those on the contrary which are merely blue, violet, green, or grey, or which have landscapes, flowers, or the like, with soft shadows painted on them, are beneficial. All objects that strongly reflect the light are much to be condemned; gold borders on walls or doors, therefore, and polished stoves, especially when they are studded with brass ornaments, ought to be avoided. Red or yellow furniture and window-curtains, carpets with white or light ground and bright colours, have an injurious influence.

For studies and work-rooms, an open prospect upon verdant places is of great value. In particular, such rooms ought to be light, and illuminated in a manner suitable to the nature of the employment of the eyes. The windows should not be low, much less should they reach down to the floor; they should be provided with proper window-blinds to moderate an excessive degree of light, and there should not be any bright or dazzling object opposite to them. The table used for the occupation should be so placed, that the light may fall upon it from above or from the left side. To prevent reflection, it should neither be of very bright colour, nor polished; in writing upon a table which is too dark, however, the white paper, being sharply bordered by the dark ground, is somewhat injurious to the eyes, for which reason a layer of some dull-coloured material, and

of a much larger size than the paper, should be placed between it and the table.

The bed-rooms must be of good size, perfectly dry, well ventilated, and of sufficient height. As places of nightly repose, they do not require the admission of more than a small degree of light, and their aspect should always be towards the west or north. The colouring of the walls should be simply green, blue, or grey. On awaking in the morning, the room should only be faintly lighted, so that the light may not be dissimilar to that of dawn. When the room is darkened by closing the shutters, care must be taken that a strong ray of light does not enter the room through any space left between them, and especially that it does not fall upon the eye of the person in bed. The bed should be placed in such a position, that neither the window nor the fire, if there be one in the apartment, be opposite to the eye immediately upon waking. It is improper to draw the curtains round the bed for the attainment of this object; they should, on the contrary, be opened as far as possible, to allow a free circulation of air. The air confined within the curtains, being rendered unwholesome both by breathing and perspiration, makes the eyes very sensitive.

What has here been said of bed-rooms is equally applicable to nurseries. With respect to the latter, I have already observed (at page 145), that the head of the cradle must be turned towards

the window, and that all shining objects, or such as are likely to draw the attention of the child constantly to one side of the bed, should be removed, and rather placed opposite to the face of the child, as otherwise squinting may be produced. The servants should be strictly enjoined to keep the nursery well ventilated, and to take away all wet or soiled linen, and to remove the bathing-water immediately after use, as damp and impure air is very apt to occasion ophthalmia in new-born children.

Rooms destined for public assemblies or other objects, in which many persons are collected together, must be lofty, spacious, and light; it is indispensably necessary that they should be so constructed, that the air may be constantly renewed and purified. The latter should be a particular object of attention in work-shops and manufactories, where much dust, and strong, noxious vapours arise while the work is going on. Museums, lecture-rooms, and all places destined for public instruction, are most properly lighted from above.

It may perhaps be thought that I have gone somewhat too far in the rules laid down as to the due regulation of light, and some persons may say, that without having ever observed such rules they still enjoy sound and healthy eyes. This may be the case with some individuals, yet it by no means limits the application of the rules, but only proves that habit has lessened the effect

of the injurious influences above mentioned. The eye, like every other organ and faculty of man, gradually accustoms itself to every thing. It is in fact truly astonishing, that such vast sources of injury as the glowing fire of smelting-ovens, blacksmiths' forges, &c., which would endanger the sight of eyes not inured to them, especially of such as are already weak, are endured daily by the eyes of the workmen who are accustomed to look upon them. From inattention to such rules as I have detailed, the eyes are rendered more liable to diseases, and if they are attacked by any accidental malady, it will be more violent, dangerous, and obstinate. Though deferred till the period of old age, it seldom fails that some complaint or other, as redness, inflammation, excessive sensibility, weakness of sight, *muscæ volitantes*, or even amaurosis, or cataract, makes its appearance; and when these evils are in part owing to neglect of the rules just specified, they may under such circumstances be very difficult to remove, or may sometimes be absolutely incurable.

SECTION III.—*Proper Management of the Visual Function.*

Exercise is just as necessary for the organ of sight as it is for the whole body. While the sight is preserved, strengthened, and brought to perfection by a proper use of the eyes, an injudicious

employment of these organs, on the other hand, tends to weaken them, injures their healthy condition, and may even entirely destroy the sight.

As we have more frequent occasion to look upon near than upon distant objects, the sight must necessarily be more constantly exercised upon the former than the latter; every opportunity, therefore, should be taken to exercise it from an early period of life upon remote objects also. We should endeavour to develope and bring to perfection, as early as possible, the capabilities of the eye—namely, correct perception and estimation of the size, distance, and position of objects, as well as accurate discrimination of colours, and of their gradations and shades. (See p. 41 and 42.) Objects which one desires to inspect closely should always be placed or held straight before and centrally between the two eyes, in order to avoid the inequality of sight in the eyes so often induced by neglecting this rule. In this manner they appear to us of their true size, in their true proportions, and in the best light. When occupied with minute objects, in reading, writing, sewing, embroidering, &c. persons should accustom themselves to keep the object as far as possible from the eyes. When the eyes feel the least sensation of weariness, let them be closed for a few moments, or turned away, and directed to distant objects, places of verdure, or a green tree. Let the employment be frequently changed, and let such occupations only be chosen

for the evening, as require but a slight expenditure of sight. Writing, and sewing, when the material in use is of light colour, fatigue the eyes less than reading or embroidering. Weak eyes especially ought to avoid all occupation by artificial light. The repose granted to the eyes must be proportioned to the exertions they have undergone. In the hours of leisure, the eye is best recruited and strengthened by diminishing the light, or by restorative means, such as I shall mention presently.

Continual inactivity of the eyes induces weakness of sight. By too great exertion, on the other hand, especially upon minute and shining objects, they are wearied, and worn out; this over-exertion should therefore be avoided, especially in youth and in old age, when the body is debilitated, or the sight is already weak. Further, the eyes ought not to be exerted immediately after waking in the morning; after meals; after taking any spirituous liquors; when the body is heated, in a stooping position, or in any manner constrained by the dress; or after severe illnesses. The injuries arising from these sources are more serious when the mind is much exerted at the same time with profound thought; when the occupation is pursued with difficulty, or with aversion; or when there is depression of spirits. Every occupation, in which only one of the eyes is called into action, or in which the one eye is constrained to

adapt itself differently from the other, induces an inequality of the power of adaptation in the eye, and weakness of sight. We must therefore refrain from a long-continued occupation with magnifying-glasses, microscopes, or telescopes, and should accustom ourselves to use either eye equally well for this purpose. The habit of reading, while walking, or riding in a carriage, being very trying to the eyes, is to be entirely condemned. The broad day-light, or the light of the sun reflected from the white paper, dazzles the eye, and from the constant motion of the book or paper, the sight is much exerted, and the eye is compelled to accommodate itself to distances continually varying.

As a very general cause of injury to the sight, may be mentioned the snow-white colour and brilliancy of the paper used both for printing and writing, and also the smallness of the type which is often employed. The extremely white colour of the paper shows, it is true, the progress which has been made in the manufacture; but this advancement of the art might be shown just as effectively, and, as regards preservation of sight, would be a much greater benefit to the public,—especially to those who read and write much, or who are suffering from any complaint of the eyes,—if a slight greyish-blue tint were given to the paper intended for writing or printing, and the paper itself were not glazed or shining. I do not mean that any

dark shade should be given to it, but it would be well if the brilliant, snow-white colour were exchanged for a dull and extremely light greyish-blue. If such paper, or at least of a cream-colour, were generally used, and the print of books were clear, sufficiently large, and of a deep black, the sight would be much less fatigued in reading and writing; intolerance of light, weakness of sight, *muscæ volitantes*, and myopy, would be often prevented; and, consequently, a good sight might be preserved more frequently to an advanced period of life. Among the ancients, the complaints of the eyes just alluded to scarcely ever occurred, and it may be observed, that neither their leaves of papyrus, nor their wax-tablets were perfectly white, but had a yellowish-brown or greyish colour. Their characters besides were large, distinct, and accordingly not fatiguing to the eye.* At the present time, the print of many books is in fact so extremely diminutive, that a magnifying-glass is often required even by a good eye to read them.

It remains to treat of the recreations of the sight, and the means by which its strength may be recruited after having been excessively or for a long-continued time exerted. These restorative means, especially such as I shall first mention, pre-

* The papyri which have been discovered at Herculaneum afford sufficient proof of this fact. The ivory tablets of the ancients were articles of the greatest expense, and were only used on occasions of gallantry towards the fair sex.

serve the healthy condition of the eyes, and improve the sight, and, as they have a beneficial and strengthening influence upon weak sight, should be frequently resorted to.

Among these the most important are: looking at distant objects; viewing green fields and extensive landscapes, where the objects are variously coloured, and mildly illuminated; residence and exercise in pure, open air, and excursions on foot or on horseback in pleasant mountainous countries. Certain diversions also are much to be recommended, among which the game of billiards may be first named, because it unites exercise of sight with moderate exercise of the body, and particularly sharpens the judgment of the eye in the measurement of distance, &c. Then cricket, tennis, and field sports may be mentioned, and for young persons games with hoops or ball; but care must be taken not to be over-heated, and to allow the necessary alternation of rest.

The theatre, if sufficiently and equally lighted, has no injurious influence upon the eyes. But if a person go from the day-light, or from the sunshine, into a dark house; if he take his place in any of the boxes which are exposed to the strong light of the proscenium; if the chandelier be of glass, and hang so low, as to throw the dazzling and various-coloured rays of light almost horizontally even to the lower boxes; if any coloured artificial fire be introduced during the performance on the stage;

if the person go to the theatre immediately after dinner ; if he remain in the house longer than two or three hours ; if he make frequent and perhaps unnecessary use of an opera-glass : in these cases, the theatre can no longer be regarded as a restorative, but must fatigue and exhaust even eyes that are in a sound and healthy state. On the drawing up of the curtain, a cold draught of air always blows from the stage round the nearest boxes and the stalls, and not unfrequently affects the body, which is probably warm at the time, with a cold shivering. As this draught falls chiefly upon the head, it is apt to occasion an inflammation of the eyes, which is perhaps still further increased by going home through a damp night-air. Playing at cards or chess is not to be reckoned here among beneficial recreations, but must rather be regarded as injurious. The first does not afford any relief to the eyes, since they are dazzled by the brightness of the cards ; the latter tries them very much, on account of the unremitting attention with which they are usually employed upon the game, while the mind is much exerted at the same time.

SECTION IV.—*Eye-glasses ; their Selection and Use.*

The ancients were not acquainted with the use of eye-glasses, nor was any necessity for them in-

duced by their mode of life, study, or occupation ; they were first introduced in the thirteenth century by two Florentines, Salvino d' Armati, and Alessandro Spina. The qualities necessary to constitute a good pair of spectacles are manifold. I shall consider them first in respect of the glasses, and then as to their mounting or frame.

The mode in which eye-glasses act, and the refraction of the rays of light in the eye depend upon one and the same optical law ; a deviation from the normal state of this refraction in the eye is therefore to be compensated by glasses.

It has already been remarked (p. 20.) that the power possessed by transparent bodies of refracting the rays of light depends principally upon their density and combustibility, and that this refractive power is proportioned to the degree of these qualities. This power is besides affected by other chemical characters of these bodies. The quality of the material, of which the glasses are made, is consequently by no means unimportant. The ordinary glasses are made of plate-glass, which is not always sufficiently hard, and often not pure enough ; but the glasses which are made of Brazil pebbles deserve the preference. When the pebble is properly cut, and the glasses are finished with care, and are well suited to the condition of the eyes, they have a beneficial influence upon the organ of sight. They are, it is true, very expensive, but are at the same time very durable, and

persons who can afford to pay for them ought not to grudge their higher price.

The material is usually colourless, but for certain purposes is made green,—which colour was chiefly used in earlier times; it is also sometimes light blue, azure, dark blue, of a smoke-like tint, or even yellow, as when made of amber, which was first used for burning-glasses by Christian Parschin, of Königsberg. Whatever material may be used for eye-glasses, the principal requisite in all cases is, that it should be as hard as possible, perfectly free from spots, striæ, air-bubbles, &c., and without mixture of colours; and in the next place, that the greatest accuracy and care should be observed in grinding and polishing the glasses. The grinding is performed upon moulds or cups, which constitute a segment of a sphere, and thus give the form to the surface of the glasses. Convex glasses are named according to their focal length, and the concave are numbered in indication of their degree of concavity. No. 1, for instance, on a concave glass, marks the smallest degree of concavity; No. 2, a somewhat higher, and so forth.*

* The numbering of glasses is unfortunately not everywhere according to the same standard. The glass which with one optician is No. 1, is by another marked No. 2. If, therefore, a person has broken or lost the glass which he had in use, say No. 2, for instance, he must not ask for and purchase at random another No. 2, but must first by carefully trying it ascertain whether the new one be suitable.

The surfaces of eye-glasses are variously shaped :

1. Both surfaces may be perfectly flat, and the glass in this case resembles ordinary window-glass. Glasses of this kind do not refract the rays of light, and are merely used to defend the eye from certain injuries.

2. The glass may be thick in the centre, and flattened towards the circumference ; it is then named a lens-shaped, or double-convex glass. This has the effect of producing convergence of the rays of light, and accordingly brings the image of the object formed in the interior of the eye more forward.

3. It may be thick at the circumference, and become thinner towards the centre ; this is named a double-concave glass. It causes divergence of the rays of light, and accordingly carries the image farther back into the eye.

4. The glass may be either convex or concave on one surface, and flat on the other ; the former is named a plano-convex, and the latter a plano-concave glass. They act in the same manner as the two preceding kinds, but in a weaker degree.

In using the glasses hitherto described, it is necessary to bring the head into the direction of the object which we wish to view. To remedy this inconvenience, glasses have been invented, in the employment of which it is only required to turn the eyes towards the object, without turning the head at the same time ; these are :

5. The periscopic glasses, as they are termed, the outer surface of which, or that which is turned away from the eye, is convex, and the inner concave; they are particularly recommended by Dr. Wollaston.

6. There are also glasses with cylindrical surfaces. Independently however of the circumstance, that glasses of this, as well as of the preceding description, being difficult to make, are seldom quite perfect, they have among other disadvantages this in particular, that objects are seen somewhat altered from their true form, and are less distinctly recognised than with the other kinds of glasses. Neither of these kinds therefore is to be preferred to those previously mentioned.

Every glass, of whatever form its surface may be, ought to be large enough to cover the eye perfectly. The oval form is better adapted for spectacles, the round for hand-glasses.

The frame, or mounting of glasses, is by no means to be regarded as immaterial. In order to avoid false light, it must be dark, and not polished; it should be easy, and somewhat flexible, that it may not become incommodious when used for a long time. The most suitable material for the frame is either unpolished blue steel, horn, or tortoise-shell. The old shape, in which the spectacles were pressed and held fast upon the nose by means of a narrow arch, was objectionable. The kind now in common use is far better; these are

fastened on the head by means of two long jointed sides. In this manner the glasses are kept in a fixed position before the eyes, and if the bridge over the nose be curved at one side only, the same glass must always be applied to the same eye, as they cannot then be used inverted; this is of importance when there is a difference in the sight of the two eyes. The frame of spectacles must be so contrived, or the spectacles at least fixed before the eyes in such a manner, that the axis of the eye may coincide with that of the glass. To see remote objects therefore the glasses must stand more perpendicularly before the eyes, and to see near objects they must be inclined somewhat forwards. The glasses moreover ought not to lie in the same plane; their position should observe the direction of an obtuse angle of such degree that the axes of the eyes, which of course converge more in reading and writing than in viewing distant objects, may exactly coincide with the axes of the glasses. If these rules are neglected, the spectacles do not represent objects clearly and distinctly; they occasion an unpleasant sensation in the eyes, and even giddiness and head-ache; and contribute likewise to produce the squinting and fixed look which is frequently observed when the spectacles are taken off. In order to keep the glasses perfectly clean, they must always be preserved in a case when not in use.

Eye-glasses have various other names besides spectacles, according to the manner in which they are mounted. Hand-spectacles consist of two glasses, in a frame either fixed or jointed, which are fastened to a handle, that serves at the same time as a sheath, into which they can be folded up. Single glasses are merely furnished with a handle. Although the use of either of the latter kinds of glasses is always very improper, it is attended with this advantage, that on account of the trouble of holding them, they are in general only used for a short time. Reading-glasses are large single lens-shaped glasses, which are chiefly employed by aged persons. The small, single, and strong double-convex glasses with a short handle, which have a strong magnifying power, are only used for the examination of minute and delicate objects.

There are also compound optical glasses, which are formed by combining the power of several glasses together. Their effect is strengthened by this arrangement, and the eye is enabled to recognise distinctly either remote, or near and minute objects. The most common of the first kind are opera-glasses and telescopes; of the latter kind, microscopes. Every compound optical instrument consists of at least two, more frequently of three, and sometimes of a greater number of glasses, which are fixed in a tube that is blackened on the inside, and capable of being folded or shut up.

The glass which is applied to the eye is named the eye-glass, that at the opposite end of the tube the object-glass, the third, or collecting-glass, is situated between the two. If the object-glass consist merely of one material, all objects seen through it appear with a coloured border; but if it be formed of two kinds of glass of different refractive and dispersing power, viz. of crown glass and flint glass, it represents objects without this mixture of colours, and is then called achromatic.

The questions now suggest themselves,—when eye-glasses should be first employed,—how one should proceed in making the choice, and—in what manner they should be used.

Whoever has recourse unnecessarily, perhaps merely in compliance with the prevailing fashion, to an eye-glass, runs the danger of so far injuring a good sight as to be unable afterwards to dispense with the glass. The frequent use of concave glasses by young people is not always the consequence of myopy, but more often the cause of this defect of vision. Persons who do not think their sight good enough for very distant objects, should by no means have immediate recourse to eye-glasses, as myopy is frequently induced by this practice; but should rather observe diligently the rules given on myopy in the third Chapter.

In the first degree of actual myopy, when even the larger, distant objects cannot be recognised distinctly and without difficulty,—though the oc-

cupations with near objects can be pursued without exertion of the eyes, if, for instance, an ordinary sized type can be read at the distance of ten inches,—weak plano-concave glasses in the form of double hand-glasses, better however in that of spectacles, may be used, but for viewing distant objects only. The single glasses so much in fashion are objectionable and entirely to be condemned, as they occasion inequality of vision, and may even induce that defect commonly termed, “a cast in the eye.” They have a doubly prejudicial influence when instead of being held by the hand, they are retained in their position before the eye merely by the knitting together of the eyelids and eyebrows. In a moderate degree of myopy, the exertion of the eyes, and even of the body, may be much relieved during such occupations with near objects as require an extensive field of view,—for example, looking over parchments and documents, or books of large size,—by the employment of very weak concave spectacles. But when there is occasion to look upon objects at some distance,—as, for instance, on the music book when playing in an orchestra, in surveying lands, in field sports, or in travelling,—they must be somewhat stronger. When the degree of myopy is such, that even large objects at several paces distance cannot be recognised without difficulty, and the eyelids are much drawn together in looking at them; when small objects, or the

book, in reading, must be brought very near to the eye, perhaps as near as three or four inches; when, consequently, use is made only of one eye to view the object, because on account of its proximity the axes of vision can scarcely be united upon it: spectacles are in such cases indispensable. One of the principal rules, however, to be observed in all cases of myopy is, to have recourse to eye-glasses rather somewhat *late* than too early.

With respect to the selection of glasses, let the choice never fall upon a single concave glass, and let it be rather upon a pair of spectacles than double hand-glasses; because glasses in the form of spectacles remain at rest and in a proper position before the eyes. Let the lowest possible number that will answer the desired purpose be chosen. If the glasses enable the individual to see distant objects clearly, or if they relieve the exertion of the eyes when employed upon near objects, they are suitable, and he ought to be satisfied with them. If he choose a higher number, he will certainly have the advantage of seeing distant objects more distinctly, but the sight is equally tried whether glasses that are too strong, or no glasses at all are made use of; in either case the myopy increases. The person desiring the aid of spectacles will always do well to apply to an experienced and intelligent optician, and to communicate the four following particulars.

1. What degree of myopy exists, that is to say, at what distance he can still see clearly; and whether it is the same in each eye. Both eyes must accordingly be tried beforehand, in the manner explained at p. 170, first together, and then each eye separately; for the latter purpose one eye should be covered, while the experiment is made with the other.

2. At what distance he wishes to be enabled to see clearly. For reading or writing, twelve to fifteen inches may be assumed as a proper distance.

3. Whether the spectacles are required only for some particular occupation, and if so, of what nature the occupation is, or whether they are intended to be worn constantly.

4. Whether he intends to use the spectacles chiefly in the day-time, or in artificial light.

If there be not any optician in the neighbourhood, or if the near-sighted person be prevented from applying personally to him, let him draw up in writing a detailed account of the above-mentioned particulars, and in reference to the first let him proceed in the following manner, which is the most simple that can be recommended. Let him take a piece of printed paper with clear legible type, and try with each eye by itself, and then with both eyes together, at what distance he can read it most easily and distinctly. Let him measure accurately this distance from the paper to the eye, let it be noted down in inches in the

written account, and let the printed paper be sent with this account to the optician, that he may see the size of the type. By means of such information any good optician is enabled to lay before, or send to the applicant several glasses, more or less suitable, from which he may make his selection. He must accordingly try several pair carefully and leisurely, bestowing some time upon each, and by no means content himself with the first that comes to hand. They should not be tried in quick succession one after the other, as the eyes by the frequent change would become strained and fatigued, in consequence of which no certain result could be obtained; but some days or even weeks must be allowed for this purpose. Careful trial is the only sure method of finding good glasses perfectly adapted to the exigency of the case. Spectacles, to be suitable, must represent the object clearly and correctly as to its size, form, colour, and distance. If the concave diminish, or the convex magnify the size of the objects; if they excite an unpleasant sensation, or feeling of exertion, weariness, pressure or pain in the eyes or head; or occasion giddiness; they are absolutely unsuitable. Good spectacles ought to create a sensation of comfort and benefit, so that on taking them off a desire is felt for the repetition of their use. As the excellence of a pair of spectacles can be determined only by long trial, an agreement should be made in the first instance with the

optician to exchange them for another pair, in case they should not be found by experience fully to answer their purpose.

As regards the use of glasses it is to be observed, that in a slight degree of myopy, spectacles should be used only in cases of the utmost necessity, and never for a long continued time; in a stronger degree of myopy, only during those occupations which would cost the eye some effort if unassisted; and even in the highest degree of that affection, they ought not to be worn constantly, but the near-sighted person should exercise himself (and this holds good in every degree of myopy) frequently and diligently in looking at distant objects with the naked eye, in order to improve the sight as much as possible. When recourse is had at the proper time to suitable concave glasses, when they are used economically, and the precepts for the general treatment of the eye are attended to, the myopy frequently disappears in the course of time, while in the contrary case it increases. After having used the glasses first chosen for some years, if the individual is not so perfectly satisfied with them as at first, the myopy has either increased or diminished. It is accordingly very injudicious to procure without farther consideration glasses of higher power, as is unfortunately the usual practice in such cases. The near-sighted person should first endeavour to ascertain the present condition of his eyes by trials of the sight

with the naked eye. If by comparing the result of the present trial with that which was obtained on first having recourse to glasses, he find that the myopy has diminished, the glasses hitherto used are either to be exchanged for weaker, or to be entirely laid aside. But if he find that it has increased, it is more advisable to retain still the same glasses, and to exercise his eyes in looking at distant objects, observing at the same time the general rules before mentioned, than to exchange them for stronger. Glasses of higher power may however be necessary, if the myopy, owing to any unavoidable injury, has so much increased, that the occupation causes exertion and fatigue to the eyes, even when proper glasses have been selected in the first instance. But it is always better to refrain as much as possible from the exchange of glasses; for persons, who without consideration are continually having recourse to glasses of stronger and stronger power, run the hazard of being at last unable to procure any glasses which can afford them satisfaction, and consequently of becoming, as it were, entirely blind. Glasses which are employed chiefly for particular occupations with near and fine objects, ought not to be used for distant objects. In a very high degree of myopy, it is well to possess one pair of spectacles for remote, and another for near objects, and even a third for occupations in the evening.

The period at which the far-sighted person requires the aid of glasses may be known by far more definite signs, than is the case in myopy. They are as follows: if he is obliged to remove small objects, or the book, in reading, to an unusual distance from the eye, in order to distinguish them clearly; if during occupation there is a strong desire for light,—on which account he holds the book in the day-time in such a manner that the light may fall directly upon it, and in the evening usually places the light between the book and his eye; if he cannot read small print without difficulty; if in long-continued reading the letters appear to move and run into one another, and near objects seem to be veiled in mist; lastly, if the eyes by employment upon near objects become easily fatigued, if a feeling of tension and pressure is occasioned in them, if tears, and even head-ache, are excited: it is then high time to have recourse to the assistance of glasses. If the use of them be longer delayed, the eyes are subject to extreme fatigue from the great exertion of the sight, and weakness of sight, *muscæ volitantes*, and chronic inflammation in the interior of the eyeball are apt to ensue. For the far-sighted person the rule is, that he should seek the aid of glasses rather somewhat *early* than too late.

In regard to the choice, he may proceed according to the directions already given for short-sighted persons. The far-sighted person must always

select lens-shaped glasses in the form of spectacles, and never make use of a single reading-glass ; for the latter can never be held so steadily but that the print will appear to be in constant motion, by which the eye is much fatigued. The glasses should be very weak at first ; they ought to represent the object clearly and well defined, but not magnified, and should produce in the eyes a beneficial sensation, which should remain when they are taken off ; the proper kind can only be found by careful trial. Convex glasses should be used for near objects only, and never for those which are somewhat remote ; when the sight is employed upon the latter, they must always be laid aside. But even when they have been most judiciously chosen, and used in the most correct manner, the glasses first employed will in the course of time no longer answer the purpose, since the form of the eye and its power of refraction alter with the advance of age. They must therefore after some years be exchanged for glasses somewhat stronger. It is on this account so much the more necessary in presbyopia to begin with the weakest convex glasses, because, if the changes of the eye require a repeated change of the glasses, it may very probably happen, that at last not any can be found strong enough to satisfy the sight. If a certain degree of dimness or weakness of sight should be present together with the presbyopia, convex glasses afford especial service, inasmuch as the convergence of

the rays of light which they occasion produces a stronger impression of the image on the retina.

Lens-shaped glasses are required also by persons who have been successfully operated upon for cataract. As the crystalline lens, the chief agent in the refraction of the rays of light, is removed by the operation from the axis of vision, the deficiency must be artificially compensated by a strong double convex glass. In some rare instances only, viz. when the patient has previously laboured under a considerable degree of myopy, he is able to recognise large letters, or objects at some paces distance, with the naked eye; but in most cases he is unable without the aid of spectacles to exercise his usual occupations, and to distinguish minute objects with perfect clearness. He ought to be provided with at least one pair of spectacles for near, and another for remote objects, each of different power; and it is frequently necessary that he should possess a third pair for particular, or for evening employments. With respect to the choice and use of cataract glasses, the directions before given in this Section hold good in this case also, the following caution only being observed:—so long as the eyes experience the least uneasy feeling; so long as they have not perfectly recovered from the consequences of the operation, the use of glasses must be entirely refrained from. As a high degree of sensibility usually remains for a long time, the eyes are irritated by the premature use of

glasses, and are apt to become inflamed. Cataract glasses, as already stated, are strong double convex glasses, and accordingly possess a considerable power of concentrating, or bringing the light to a focus in the interior of the eye. The individual must therefore be on his guard against looking at the sun with them. If the eye, when using a cataract-glass, is unpleasantly affected merely by looking upon a bright fire, by looking at the sun it would be dazzled to such a degree, that the sight might be seriously injured, or even entirely destroyed.

Coloured glasses have always for their object, to moderate ordinary light for eyes that are very susceptible, and intolerant of light; or to defend them during their occupation with bright objects against the stimulus of a too strong and dazzling glare of light. But coloured glasses, of whatever material they are made, and of whatever colour this material may be, have this inconvenience, that objects are not discerned through them so easily and quickly—it is more difficult, as it were, to look through them, and consequently they always in some degree, however slight it may be, strain the sight. This circumstance must therefore be kept in view, since, if weakness of sight should exist together with the intolerance of light, the mischief arising from the use of such glasses would outweigh the benefit. In such a case, it would be better to keep off the injurious stimulus of light

by wearing an appropriate shade. Spectacles of this kind ought to be provided with side-pieces of the same coloured glass, or which is better, of gauze; or the glasses should have a spherical form, so that they may be brought close to the eye without in the least degree impeding the motion of the eyelids or eyelashes, and still allow a sufficient access of atmospheric air. The surfaces of these glasses are usually quite flat, sometimes however they are made concave for near-sighted, and convex for far-sighted persons.

But which now, it may be asked, is the most proper colour for glasses of this kind?—In resolving this question, it would be very wrong to consider the colour of the glasses merely with reference to the colour in which objects appear through them; for, since these glasses are intended solely to moderate the light for the eye, the attainment of this object must depend entirely upon the effect which the light, that is altered by them in its passage to the eye, has upon the retina. In reference to this, what has been said at p. 223 holds good, and is of the greatest importance. Farther, it is a property of the eye, after having viewed any particular colour for a long-continued time, on being turned away, to produce in itself a sensation of another colour, which, according to a certain rule, always corresponds to the original colour, and lasts for some time; or in other words, every colour leaves a corresponding coloured illusion,

or spectrum, in the eye. Looking with the naked eye at any particular colour, or looking through a coloured glass is exactly the same with regard to the effect which the colour has on the nervous membrane of the eye; in each case the coloured illusion or spectrum is left in the eye. When a person, after having used coloured glasses for a long time, lays them aside and sees without them, the images of objects formed upon the retina are blended with the spectrum which the glass, immediately after being removed, leaves in the eye, and all accordingly appears in the colour of the spectrum. Thus after the use of green glasses, all objects appear of a reddish hue, and after the use of blue, of a yellowish colour. This sensation of colours, or spectrum, and the appearance of objects in the colour of the spectrum, is not only unpleasant, and frequently even painful, but also more injurious and prejudicial than the stimulus of ordinary light, especially if the eyes happen to be already suffering from weakness of sight, or from *muscæ volitantes*; while in unhealthy or very sensitive eyes, occasion may be given by the repeated sensation of the spectrum even for internal chronic diseases of this organ. So far then from any advantage being derived, only mischief is to be expected, from the employment of these glasses, unless they are of a proper colour.

In my opinion those glasses only answer the de-

sired purpose, viz. that of moderating or keeping off too strong a stimulus of light, which instead of modifying the quality, allow only a certain quantity of light to reach the eye. I have already remarked, that grey—being composed of white and black—may be regarded as analogous to shade, and that this colour makes the slightest demand on the activity of the retina; glasses of no decided colour, but of one standing nearest to grey, a tone called the neutral tint, fulfil therefore this purpose in the most perfect manner. On looking through such glasses, objects appear under the same tone of colouring as is observed when the sun is veiled by clouds; and on removing the glasses from the eye, it seems as if the sky had again become clear. Glasses of this kind never leave a spectrum.

A few words remain to be said, in particular, respecting glasses made of amber. With regard to their colour, what has just been said of coloured glasses in general, is equally applicable to them, and the more so, since yellow, of which colour all objects viewed through them appear, is actually that colour, which, standing among the primitive colours the nearest to white light, possesses the property of exciting the activity of the retina in the highest degree. By experiments on the temperature of the different colours of the prismatic spectrum made by means of a delicate thermometer, it has been proved that yellow light is

warmer than green or blue ; yellow light is therefore more heating in its effect upon the eye. Amber has it is true, from its high degree of combustibility, a great refractive power, but it possesses less density than any other material that is used for the purpose under consideration ; and since, moreover, it is not often of uniform density throughout its substance, and is seldom sufficiently clear and pure, this refractive property must be unequal. A fine good polish is of the utmost importance in all eye-glasses ; now to amber such a polish cannot be imparted on account of its softness, and by frequently cleaning and wiping the glasses it is easily injured, the surface becoming dim and scratched. Besides, these glasses being apt to split at the edges, and being altogether less durable, require the greatest caution in their use. It has been asserted, that glasses made of amber are better adapted to moderate bright and strong light, and are more beneficial to the eyes than the glasses in common use ; on what principles however this assertion rests I have not been able to satisfy myself even by actual experiment. If the amber used for this purpose were previously purified with great care, so as to be made perfectly clear and colourless, and were at the same time by pressure rendered harder, and of uniform density throughout its substance, I am not disinclined to believe that it might in some respects be better for convex and concave glasses than the ordinary ma-

terial; but as long as these glasses retain the slightest tinge of yellow, and the usual softness of amber, they can by no means be allowed to deserve any preference.

To defend the eyes against dust, keen wind, smoke, or noxious vapours, glasses with flat surface, perfectly clear and colourless, mounted in a spectacle-frame furnished with side-pieces of glass or gauze may be employed; but those with spherical surfaces are more serviceable, as they may be brought closer to the eye, and still do not prevent the necessary access of atmospheric air. As they are intended merely to afford defence against the severe effect of these sources of injury, all those contrivances which entirely surround the eye are unnecessary, and even prejudicial. When by any such contrivance the access of atmospheric air to the eye is prevented, the eye is placed in a higher temperature, increased perspiration is occasioned, and the vapour becoming condensed on the glasses renders it necessary for them to be frequently taken off and wiped; the almost inevitable result of which is a cold in the eye by reason of the change of temperature. Spectacles formed of gauze or crape are not so much to be recommended for this purpose, and are injurious in those cases where any complaint of the eyes, as *muscæ volitantes*, or weakness of sight already exists, since, as objects are discerned through them indistinctly and imperfectly, the sight is subject to some exertion;

the colourless and spherical glasses before mentioned therefore deserve the preference.

Under the name of “preservers,” are understood spectacles intended to preserve and strengthen the sight of sound eyes, or to defend them from future weakness. If any other than the two kinds just described are hereby intended, nothing can be said in their favour; inasmuch as for sound eyes, free from defects, no such thing as preservers exists. Every material used for eye-glasses, be it ever so pure and clear, is still always a denser medium than atmospheric air, and possesses some internal properties, not yet sufficiently investigated, by means of which the rays of light undergo a change, and consequently the sight must be somewhat differently affected than by unaltered light;—a circumstance which can never be immaterial to so delicate an organ as the eye. It is just as great folly to make use of spectacles when the eyes are sound, as it would be for a person not lame to walk with crutches; for “Spectacles,” says the celebrated Professor Beer, of Vienna, “are crutches for the eyes.”

Every kind of squinting-spectacles is improper, as I have shown at p. 148, when speaking of squinting itself.

SECTION V.—*On certain Sources of Injury indirectly affecting the Eye.*

The effect produced in the system by certain substances which act as stimulants to the organs of taste or smell, extends itself to the eye, and may occasion diseases in it, if these articles are either adulterated, or used in excess.

Prepared drinks, containing narcotic or bitter ingredients, or a large proportion of carbon, have an injurious influence upon the sight through the medium of the nerves and blood-vessels, and occasion, among other complaints of the eyes, *muscæ volitantes*, weakness of sight, and amaurosis. Prudence and moderation therefore are to be recommended in the choice and use of these articles. This holds good in particular with respect to coffee, strong ale, or stout, new or adulterated wine, liqueurs, cordials, and all spirituous preparations that contain powerful medicinal ingredients. The long-continued use of narcotic medicines also may occasion injury to the eyes.

Tobacco, independently of its effect upon the whole system, has, by its narcotic power, a prejudicial influence upon the eyes, which is further increased when it contains, as is so frequently the case, various and sometimes highly deleterious admixtures. As it would lead us too far to mention all the various adulterations and foreign

matters that enter into its composition, partly by the direct admixture of strong narcotic, acrid drugs from the vegetable kingdom, pungent aromatics, various salts, &c. &c., partly from the use of copper vessels in the manufacture, or of leaden cases for packing; we shall confine our attention merely to the signs by which the adulterations may be known, and to the evils resulting from them. We must consider it under both the forms in which it is used, viz. as snuff, and as tobacco for smoking.

Adulterations of snuff, producing evils of various kinds in the nose, when this organ is very susceptible, must excite similar morbid action also in the eye; since the organ of sight is intimately connected with that of smell, by the continuation of the mucous membrane through the lacrymal duct, and the communication from one organ to the other is further facilitated by the ramifications of the nerves and blood-vessels. In the nose arise suppression of the mucous secretion, inflammation, thickening, and ulceration of the mucous membrane; the same effect may be produced in the lacrymal duct and sac, as well as redness, inflammation, ulcers, and disfigurement of the edges of the eyelids, or of the conjunctiva. If these adulterations are of such kind as to affect the interior of the eyeball, their action is exerted principally upon its nervous system, and then intolerance of light, weakness of sight, *muscæ voli-*

tales, chronic inflammation, and a series of dangerous complaints of the eyes ensue. The red oxide of lead, used as a colouring matter for snuff, has a slow, but so much the more certain effect; the preparations of ammonia, on the other hand, which are used for the St. Omer, Domingo, and several other snuffs, are quicker in their operation. The presence of oxide of lead is indicated during the use of the snuff by dryness of the nose, diminished secretion of the lacrymal moisture or dryness of the eye, and dulness of sight; adulterations by ammoniacal preparations, or other acrid substances, are known by the strong irritation produced in the mucous membrane of the nose and the lacrymal organs, and by the sneezing that is excited; and narcotic ingredients by giddiness, stupor, and obscurity of vision.

Tobacco, as used for smoking, even when pure, and especially when adulterated, is in three different ways detrimental to the eyes. First, the smoke is offensive, and when arising from adulterated tobacco injurious, even to healthy eyes, and still more so to those possessed of a high degree of sensibility; in the next place, the salivary glands are stimulated in an unnatural degree, the consequence of which is a great loss of fluid; and lastly, the nervous system of the eye is particularly affected by it. Hence arise pain, redness, and inflammation of the eyes, convulsions and spasm of the eyelids, intolerance of light,

muscæ volitantes, weakness of sight, &c., evils which may prove incurable, when they are of long standing, and the exciting cause still exists. Adulterations of tobacco may be pretty well known by the following signs. The smoke of pure, good tobacco has a dark blueish aspect; when, on the contrary, it is of a chalky-white colour, the presence of a strong proportion of alkalies may be suspected; when it is black, and sooty, it indicates empyreumatic oil, or resinous vegetable ingredients. If it occasion sharp, pricking pains in the eyes, or excite tears and cause convulsive motions of the eyelids, it contains ammoniacal, or other stimulating materials. The excitation of tears, and discoloration of the teeth, lead us to conclude that there is a strong mixture of alkaline salts or sulphur; the appearance of mists, or glimmering lights before the eyes, the trembling and vanishing of objects, giddiness, head-ache, and paleness of the face during or after smoking, create suspicion of adulteration with opium, cherry-laurel leaves, or some other narcotics.

It is evident from hence that the greatest precaution and moderation are necessary both in the choice and use of tobacco and snuff. The abuse even of the purest unadulterated tobacco renders the eyes more sensitive, when they are in a healthy state; and where a high degree of sensibility already exists, it advances to the stage of disease with all its consequences. Cigars in particular ought to be used

but moderately, as their smoke frequently floats round the eyes in thick clouds; persons strongly addicted to smoking ought rather to make use of a pipe, and should wash their eyes very often with cool, pure spring water. Strongly medicated snuffs, which are sold under the name of eye-snuffs, should never be taken as the ordinary snuffs, but should be regarded as a medicine, and only used according to medical direction.

Artificial means are sometimes employed to improve or restore the beauty of the skin, which produce, it is true, brightness and lustre for a time, but occasion afterwards repulsive ugliness.* These cosmetic remedies are generally compounded with ingredients belonging to the class of preparations of lead or mercury,—both, as is well known to every physician, most destructive poisons to a healthy eye. For the preparation of the red paint, the red oxide of lead or vermilion are frequently used; for the white paint, white lead or oxide of bismuth. The lotions likewise contain ingredients of the same kind, and sometimes also a large quantity of camphor. Now whether we apply to the neighbourhood of the eyes

* In ancient Greece and Rome the business of painting the skin was elevated even to the rank of an art, which was named the *cosmetic* art, and ladies of wealth and distinction kept female slaves for this express purpose. But their paints consisted for the most part of the less injurious materials procured from the vegetable or animal kingdom.

ointments composed of such preparations, or cosmetics of this kind to the skin of the face, especially to the cheeks and eyebrows, the result will be pretty much the same; since though the latter contain but a small quantity of such ingredients, by repeated and constant application their effect must be nearly equal to that of the former. It is found by experience that such cosmetics are as prejudicial to a healthy eye, as those ointments are salutary when the eye is diseased. The consequences of their use are redness, inflammation, formation of ulcers in the conjunctiva, morbid secretion of mucus from the glands of the eyelids, and a weakness of sight which is generally incurable. It would perhaps be vain to entertain the hope of abolishing entirely the employment of these remedies, but we could wish that they were used with moderation, and that those only were employed which are furnished by the vegetable or animal kingdom. Before any one of the cosmetics is selected for exclusive use, it might be submitted to chemical analysis, in order to be satisfied that its power of injuring is but slight.

The same observations are applicable to the articles that are employed for dying the hair of the head and eyebrows, if they contain caustic substances, such as nitrate of silver, antimony, lime, &c. The mode in which certain powders are used for this purpose, when, for instance, they are made into a paste with some liquid, and then

laid upon the head during the night, must endanger not only the general health, but especially the healthy condition of the eyes, by their caustic property, and also by the influence of the cold and moisture continued during six or eight hours.

Even the wearing of wreaths of artificial flowers may occasion disorder in eyes that are highly susceptible, when these flowers are coloured with acrid and poisonous materials, which, during the time when the skin is in a state of increased activity, are taken up by its pores and absorbents, and thus have a very noxious effect, especially on the retina and the nerves of the eye.*

SECTION VI.—*On certain Sources of Injury directly affecting the Eye.*

Profuse perspiration, frequent tears, mucus, dust, and smoke occasion by their irritating nature an unpleasant sensation in the eyes; when any

* The Countess T——, having worn a wreath of artificial flowers in her hair at a ball given at the Austrian Court, and having considerably heated herself with dancing, felt herself unwell on the following day, and her eyes at the same time were painful, red and swollen. Some green spots which appeared on the forehead awakened suspicion in the mind of her medical attendant respecting the wreath, which was accordingly subjected to chemical analysis when it was found that the green leaves were coloured with Scheele's green,---a preparation of arsenic and copper, which in this case was attended with a poisonous effect, and brought on a complaint of the eyes followed by a permanent weakness of sight.

such causes of irritation therefore occur, frequent cleansing with pure tepid water, or milk and water, is to be recommended.

When any substance, which from its acrid, corrosive quality produces injury by chemical action, such as mineral acids or their vapour, unslacked lime, cantharides, mustard-powder, &c. has gained access to the eye, or if boiling water or oil has spirted into it; a little pure oil of almonds, cream, or some other mild unctuous matter, as fresh butter, for instance, should be introduced immediately under the eyelid, to soothe and moderate the corrosive effect, and rubbing the eyes as well as pressing the eyelids strongly together should be avoided. In cases of scalding or burning of the eyelids, tepid oil of almonds, or which is better, of linseed, applied without loss of time to the part affected by means of a linen rag thoroughly soaked with it, is far preferable to the application of cold water, vinegar and water, or poultices of raw potatoes, which have been frequently recommended. If the injury is considerable, disfigurement of the eyelids or a disturbance of sight may ensue, unless recourse be had to professional assistance.

In cases of injury from substances that act mechanically, such as dust, sand, nibs of pens, small insects, &c. rubbing and pressing the eyes should be particularly avoided. When the foreign body is but loosely seated in the eye, let a slight pres-

sure be used with the fore-finger of one hand on the inner corner of the eye and on the nose, to prevent the escape of the tears by the lacrymal canal, and with two fingers of the other hand let the eyelids be opened as far as possible. By this means the foreign body will either be washed away by the tears, or will at least be brought into view at the anterior surface of the eyeball, or at the inner corner of the eye, from whence it may be easily removed by the tip of a fine, soft pocket handkerchief. But if this does not happen, and the offending substance is deeply situated beneath the upper eyelid, let this lid be drawn down by the eyelashes a little from the eyeball and over the lower lid, and held for a short time in this position; if the upper lid be then again released, the foreign body usually remains deposited upon the edge of the lower lid, from whence it may be removed with the handkerchief. If even this does not succeed, let the upper lid be drawn a little forward from the eyeball, let the globe itself be turned downwards, and now let the body be removed by means of a hair formed into a loop, introduced between the lid and the globe; or, having carefully turned the lid back, take the substance off by means of a soft camel-hair pencil dipped in milk. The same mode of proceeding may be adopted for the removal of the intruding body, when it is situated beneath the lower lid. It sometimes happens that a hair of the eyelashes being inverted

upon the eyeball occasions irritation and redness : in this case likewise let the lid be a little removed from the globe in the manner directed above ; let the lash be now drawn forward with a bristle or a fine needle and brought to its right position, taking great care however not to touch the soft parts with the needle. After the offending substance is removed, the eye should always be washed with cool spring water. But if the foreign body has penetrated the membranes of the eyeball, and is held fast in it, as usually happens with particles of stone or iron, sparks of glowing metal, grains of gunpowder, and pieces of percussion-caps from the discharge of fire-arms, when they fly with force towards the eye, let all attempts to remove it be refrained from ; let the eye be gently closed and some cold water applications be made, to prevent inflammation ; and let professional assistance be immediately sought. While the case is recent, the offending body may be removed with little trouble ; but if it is of some standing, inflammation, followed by ulceration, developes itself, and if this should happen in the cornea, vision may be obstructed by the formation of a cicatrix.

Pressure, blows, or contusions of the eye or its neighbourhood, concussions of the brain, or other injuries of the head, are extremely dangerous to the organ of sight. They are apt to affect especially the interior and tender parts of the eye in

such a manner, that the consequence, though often not apparent till a long time afterwards, is manifested in a diminution of the power of vision, which at length may be in some degree or even entirely lost. By proper and timely assistance however the more serious consequences, one of which not unfrequently is amaurosis, may be often averted.

Wounds of the eyeball, when the parts are at the same time torn or bruised, are extremely dangerous, and generally followed by amaurosis, or cataract, sometimes even by partial or entire destruction of the globe. Clean cuts from a sharp instrument are less dangerous, when not deep or extensive, if they are at the instant judiciously treated. Wounds of the eyelids, especially such as are attended with loss of substance, heal with difficulty, if left to themselves, on account of the great mobility of the parts. They either leave disfiguring scars, or else the edge of the eyelid is either inverted or everted; if the lid is inverted, the eyeball is kept in a state of constant irritation approaching to inflammation. If the inner canthus of the eye be injured, the improper healing of the wound may cause the *puncta lacrymalia* or the lacrymal duct to be closed, in consequence of which the lacrymal moisture flows down continually over the cheeks. In all these cases let applications of cold water be made without intermission from the first moment till medical assistance

is obtained, in order to keep down the violence of the inflammation; let the eyelids be gently closed as in sleep, and let all pinching and pressing be abstained from, especially in injuries of the eyeball itself.

SECTION VII.—*On certain Disorders of the Eyes, and Diseases of the Body with reference to the Eye.*

From the influence of keen, dry winds in travelling, it often happens that the eyes and surrounding parts begin to redden and swell, while a feeling of heat and tension is experienced in them; these inconveniences disappear much more readily by copious ablutions with tepid, than by the application of cold water.—Cold spring water is, generally speaking, only to be recommended, when there is neither excessive perspiration in the neighbourhood of the eyes, nor in the body any predisposition to, or actual symptoms of catarrh, or rheumatism. It has been found by experience that, when inveterate colds in the head have suddenly disappeared in consequence of frequent washing with cold water, perfect blindness has ensued. Where no disorders of this kind are present, it is an excellent means of refreshing and strengthening the eyes, especially during employments in which the sight is long exercised, particularly during midnight study. Washing the

neighbourhood of the eyes with cold water, as also behind the ears and the back of the neck, is to be recommended as particularly beneficial.

The distinct red spots, which sometimes suddenly make their appearance in the conjunctiva of the eyeball, are merely particles of blood which have escaped in consequence of the rupture of a small vessel by violent exertion in sneezing, coughing, vomiting, shouting, lifting heavy weights, &c. They are not dangerous, and usually disappear spontaneously after some time, if they are small and do not spread. If it is desired, however, to get rid of them more quickly, applications of warm red wine, or brandy and water, may be made.

Inflammations of the eyes in youth not unfrequently leave opacities or specks upon the cornea, which, though often so small that only the experienced eye of a medical man can detect them, nevertheless interfere more or less with the sight. Young people who have no recollection of the inflammation, nor any idea of the trace which it has left, torment themselves often for a long time to no purpose to find a suitable pair of spectacles, which may enable them to see distinctly; for evils of this kind no relief is to be found from the use of spectacles, but only from medical treatment. Although specks and opacities of the cornea are very obstinate, by due perseverance they frequently yield to suitable local and general remedies, if the evil has not been of too long standing.

Convulsions, or twitchings and quiverings of the eyelids are of frequent occurrence, and more especially in persons of very irritable, nervous temperament, and in hysterical women. They are unpleasant to those who suffer from them, and during their continuance produce more or less indistinctness of vision. Persons troubled with them should guard against excitement of the feelings, errors in diet, and exposure of the eye to cold or draughts, by which this convulsive state is usually brought on, or is at all events aggravated. Momentary relief may be often afforded by rubbing the lids for a little while, or by pressing slightly upon the neighbouring parts. This evil is generally alleviated, or it may be entirely cured, by rubbing the neighbourhood of the eyes with opium dissolved in warm water, or by warm fomentations with infusion of camomile flowers, or of henbane leaves; it is also serviceable to drink a cup of camomile-tea in the evening, and to take some aperient medicine. Blinking, or opening and closing the eyelids in frequent and rapid succession, in young persons, generally originates from habit, and in older persons is owing to an intolerance of light. In the former case, remonstrances may avail in curing the habit, in the latter the inconvenience may be alleviated either by the use of neutral-tinted spectacles, or by wearing a shade.

A *hordeolum*, or sty, is a little red, and highly sensitive boil, which is formed upon the edge of

the eyelid, beginning with a sensation of tension and itching pain; the swelling gradually becomes soft, and presents a yellow point in the centre, on the bursting of which matter is discharged, and all the pains subside. At the commencement, that is, so long as the swelling is but little raised, and while the pricking and itching pain is felt, suppuration may perhaps be prevented, and the styte may be dispersed by continued applications of cold water, and by the use of a purgative. But as soon as a beating and throbbing sensation is experienced, and the swelling becomes more elevated and defined, no further attempts must be made to disperse it, but the suppuration which has now commenced should be promoted, for which purpose warm bread and milk poultices, with the addition of a little saffron, may be laid upon it. In young persons of strumous habit, or in persons more advanced in life, who labour under derangement of the digestive organs, cold water applications are always improper, since they would cause the styte to become indurated, and thus to form a tumour known by the name of *chalazion*; in these cases, it is necessary to procure a quick development of the swelling and suppuration by means of the warm poultices. As soon as the styte has ripened and burst, all the matter must be carefully pressed out; for if this be neglected, the induration may even yet take place, which is difficult to remove, an operation being in many cases

the only method. A more simple and effectual mode of curing the sty, by which both the sup-
puration and induration may be avoided, is the
following: Let the eyelashes be entirely extracted,
and the earlier the better, from the spot where the
sty is forming, which is always easily practicable,
and, even if suppuration should have already be-
gun, gives but little pain. After the removal of
these few eyelashes, the patient instantly experi-
ences great relief; on the following day all traces
of the sty have usually disappeared, and the eye-
lashes afterwards grow again. In this mode of cure
neither applications of cold water, nor warm poul-
tices, are at all necessary.

The redness of the edges of the eyelids, especially
of their corners,—so frequently seen amongst all
classes of society, but more particularly in the lower
class, where it manifests itself in a chronic state,—
is an inflammation of the membrane covering the
edges, and of the small glands situated on the
margin of the lids (*glandulæ Meibomianæ*). This
redness, being only one symptom of the inflam-
mation, is accompanied, especially in damp and
changeable weather, by smarting, burning, and
swelling of the edges of the eyelids, by twitchings,
and a peculiar feeling of tension in the lids; and
in a more advanced stage of the affection, by the
lacrymal moisture flowing more or less copiously
over their edges, and by the lids as well as the
eyelashes being often firmly agglutinated with mu-

cus on waking in the morning. The tears are acrid, reddening the cheeks as they flow over them; the mucus is of an excoriating nature, and not unfrequently occasions ulcers on the edges of the eyelids.

Individuals of strumous habit, and those who are inclined to catarrhal affections or to a congestive state of the head, who live in an impure atmosphere, or indulge in frequent use of fermented or spirituous liquors, and persons whose eyes are exposed to the influence of strong light, acrid vapours, dust, cold winds,—especially if combined with fog, rain, snow, or sleet, are particularly liable to this complaint. Exciting causes of such nature therefore are to be avoided, and in other respects the rules which have been given on struma in the second, and on catarrhal affections in the fourth Chapter, are to be observed.

But as soon as the symptoms of the disorder manifest themselves, it is of the greatest importance to keep the eyes in a state of perfect cleanliness. They must be washed several times in the day with tepid water, and well dried afterwards. When the lids are agglutinated in the morning they must never be separated by force, but the incrustation by which they are held together is to be softened with warm milk and water, or with oil of almonds made lukewarm. If a sponge, dipped in warm water, after the water has been pressed out, be held for some minutes on the eyes, the

incrustation may easily be removed and the lids opened. It is necessary to be careful not to tear out the eyelashes which adhere to each other, since when this is done, it aggravates the complaint and occasions ulceration on the edges of the eyelids. But when an ulcer has already begun to form, let the eyelashes be carefully extracted with a pair of forceps, for by this means the ulcer heals more readily, and the bulb which generates the hair is not so apt to be destroyed. When the eyelashes have been extracted in this manner, they afterwards grow again, but those which have fallen out by ulceration are never restored. After the eyes have been perfectly cleansed, it is serviceable to foment them with simple warm water or with decoction of poppies, or to apply a warm bread poultice moistened with oil of almonds. Diaphoretics, purgatives repeated for a few days, warm foot-baths, a blister to the nape of the neck, are also of great service. If these means do not suffice, let recourse be had to a medical practitioner, as otherwise the evil may remain for months or years—nay, may prove absolutely incurable. Blear-eye, disfigurement of the edges of the eyelids, loss of the eyelashes, and inversion or eversion of the lids are but the slightest consequences of neglect in this disorder.

The affection of the eyes called puro-mucous ophthalmia or *blennorrhœa*, is an inflammation which has its seat in the conjunctiva, and in the

more severe cases implicates the other textures also, and especially the cornea. When this inflammation has an acute course, it may make such progress in a few days—nay, even in twenty-four hours, as to endanger the sight or even entirely destroy the eye; when it is chronic, it lasts many months, or even years, and from neglect or improper treatment, it may have likewise the same sequel. It is either primary, as the ophthalmia in new-born children (See p. 139), the inflammation arising from contagious virus of certain kinds, and the disorder of which I shall presently speak; or it is secondary, being a consequence of inflammation of the eyes arising from struma, cold, rheumatism, and in this case it generally becomes chronic. The characteristic symptoms are redness and swelling of the eyelids, but especially of the conjunctiva in its whole extent. The conjunctiva, being the seat of the evil, is altered in its texture, loses its polish, and becomes rough and sore; it is likewise altered in its function, inasmuch as there is at first an increased secretion of tears mixed with white mucus, then of mucus alone, and lastly, of pus. The secretion is very copious and acrid, ex-coriating the parts with which it remains for any length of time in contact. Burning pains, great intolerance of light, and dimness of sight are the further symptoms of the disorder.

The rules just given to prevent the redness of the edges of the eyelids, hold good for the pre-

vention of puro-mucous ophthalmia also; but as this disease is far more injurious to the eye, and exceedingly dangerous to the sight,—especially in primary cases,—professional aid cannot be too early sought.

Puro-mucous ophthalmia is highly contagious—which in some measure may be said of every inflammation of the eyes where a purulent discharge exists;—especial care must therefore be taken not to allow any of the matter discharged from a diseased eye to come into contact with a healthy one. It may be here further mentioned, that whenever any portion of the purulent discharge from an open sore or morbid mucous membrane is incautiously introduced into the eye, the same diseased state is very likely to be produced in that organ. This purulent matter is sometimes of such virulent power, that when transferred to the eye, important parts of that organ may be materially injured in a short space of time, and the sight partially or entirely lost. Mr. Lawrence relates,* that out of fourteen cases of blennorrhœa, “loss of vision took place in nine [from sloughing, suppuration, and opacity of the cornea. In two of these one eye was lost, and the other recovered. Sight was restored in the other five, with partial opacity of the cornea, and anterior adhesion of the iris in three of the number.”

There remains yet to be mentioned one of the

* Treatise on the V. Diseases of the Eye, p. 25, London 1830.

most important of the primary blennorrhœæ, which was brought to Europe from Egypt by the troops employed in that country during the expedition under Napoleon, and has thence been named the *Egyptian ophthalmia*. In warm climates, as in Egypt, Persia, and India, it is indigenous, and there can be no doubt that the same kind of disease was known before this expedition, and even to the ancients, in several parts of Europe, viz. in southern Italy and Sicily, and in the south of Spain. The devastation which this disease occasioned, both during and after the expedition among the British and French, and at a later period among the Prussian troops, and its still more recent ravages among the Russian, Polish, and Belgian armies, are well known.*

* The following instances, cited by Mr. LAWRENCE in his valuable Treatise on the Diseases of the Eye, sufficiently prove the formidable nature of this disease.

Dr. VETCH states (*Account of the ophthalmia which has appeared in England since the return of the British army from Egypt*, p. 69.) that from a battalion consisting of "somewhat above 700 men, 636 cases of ophthalmia, including relapses, were admitted into the hospital, from August 1805 till the same month in 1806; of these 50 were dismissed with loss of both eyes, and 40 with that of one." The same physician informs us, (*Practical Treatise on Diseases of the Eye*, p. 183.) that from the English army which was stationed in Sicily in 1806 more than 130 cases were sent home totally blind. SIR P. MACGREGOR says (*Account of an ophthalmia which prevailed in the Royal Military Asylum; Trans. of a Society, &c. Vol. III. p. 50.*) that 2,317 soldiers were on the 1st of Dec. 1810, a burthen upon the public from blindness in consequence of ophthalmia, exclusive of those who had lost the sight of one eye only. ASSALINI states, that two-thirds of the French army were affected with ophthalmia at

This disease is both epidemic and contagious. At the first moment of its occurrence, it resembles a cold in the eyes, but the symptoms are soon aggravated, and assume various aspects according to the constitution of the patient, the state of the weather, and other circumstances. Vision is impaired, the pain is dreadful, the whole system morbidly deranged, and fever present. If the disease is not properly treated from its first commencement, it may, when very active in its course, irrecoverably destroy the eyeball in a few days, or even in twenty-four hours; when it is of a more chronic character, it may last for months. It attacks particularly robust individuals, and manifests itself chiefly among the lower classes; accordingly in the epidemics just mentioned, its ravages were almost exclusively confined to the private soldiers, nearly all the officers remaining free from it, because the latter are less exposed to the exciting causes.

The following are among the chief causes of this disease: violent irritation of the eyes from excess of light; exposure to keen winds; a congestive state of the head, arising from improper clothing of the head and neck, or from other

one time. MUELLER relates (*Erfahrungssatze*, p. 159, and following) that from 1,604 cases, including 200 relapses, which occurred in the Prussian garrison of Mentz during three years and a half, 1,345 were restored to the service perfectly well; 15 became blind with both eyes; 18 remained with impaired vision of both eyes, and 26 remained blind of one eye.

causes; cold, and suppression of perspiration; great exertion; want of cleanliness; unwholesome food; the frequent use of brandy, or of new, bad wine.

It is of the utmost importance that measures should be adopted for the prevention, as far as possible, of a disease so truly formidable. It would contribute very much to prevent the occurrence of the disorder among the military, if individuals of strumous habit were not admitted into the service, and if the troops were clothed in such manner as is not likely to induce a congestive state of the head and eyes. The covering of the head ought to be light, and should afford sufficient shade to the eyes; the articles of dress about the neck and hips should be easy, and those of the feet warm. The hair of the head should not be cut too short behind. Choice should be made, moreover, of healthy situations for quartering the troops. The barracks and all places where they are lodged should be spacious and clean, and attention should be paid to the cleanliness of the person and dress of each individual. After the performance of their exercise and manœuvres, all cold should be avoided. During fatiguing marches, or severe military service, the soldiers, while bivouacking in the open air, or in marshy countries, as well as the sentinels on guard, ought to be provided with a warm garment for the night, to defend them against damp,

cold air,* and the head in particular must be kept warm. They should be supplied with good and sufficient food, and not be permitted to indulge in the frequent use of brandy, or new wine. In warm climates, the surgeons should examine the troops from time to time, and during the examination should be particularly observant of diseases of the mucous membranes and the skin. As soon as the first signs of this inflammation appear among the soldiers, suitable and vigorous medical treatment ought to be immediately resorted to, and the progress of the disease closely watched. To prevent the communication of the contagion to others, those who are seized with it should not only be strictly separated from their healthy comrades, but in hospitals should also be kept apart from the rest of the patients; the rooms should be well ventilated, and the greatest cleanliness observed; each patient ought to have the articles indispensable to cleanliness, such as towels, &c. reserved for his own exclusive use. In epidemics of this kind, it is necessary even to keep the patients who are affected with it separate from each other, according to the different stages of the

* Dr. Vetch (*Medical Sketches of the Expedition to Egypt*, London, 1804.) mentions that of four officers who slept in the same tent, in Egypt, two took the precaution to bind their eyes up every night when going to rest, and the two others did not; the latter were in a very short time attacked by the disease, while the other two escaped.

disease. That part of the troops which is still healthy should be informed of the contagious nature, and the great danger of this malady, and warned against intercourse with the patients.

The lacrymal glands and ducts are subject to many diseases of various kinds, which principally manifest themselves either by an alteration in the secretion of the tears, or by their being obstructed in their passage through the lacrymal ducts; in which cases the eye or nose is either too much moistened, or there is a sensation of dryness in it. All these diseases must be referred to the timely aid of the ophthalmic surgeon, for if they are neglected, evils of an extremely unpleasant nature may arise from them, which may last for years, or perhaps for the whole life.

Respecting the mode of treatment of the eye in such constitutional diseases as inflammatory eruptions, catarrh, rheumatism, &c. the necessary directions have already been given in the second and fourth Chapters of this Treatise. But inflammatory fevers also, and violent inflammations of the head or chest, &c., may involve the eye in their sufferings, in which case it becomes irritated, reddened, and painful, discharges tears, and is intolerant of light. In these cases let the eyes be frequently washed and cleansed from perspiration and dust with tepid water, and well dried afterwards; let them never be exerted; let all irritation from light, cold, and the slightest draught

of air be avoided; and let precautions be used to keep the air of the apartment in a wholesome state. The symptoms above mentioned ordinarily disappear of themselves with the general disease, but if the eye be irritated or exerted, they may be so far aggravated as to cause an independent inflammation, which, though not dangerous, is very apt to leave a considerable intolerance of light that lasts for a long time. During convalescence from severe illnesses, especially after nervous fever, or violent inflammation, it is necessary to avoid all irritation from light, and to refrain from every exertion of the eyes with reading, or occupation with fine work of any kind; the eyes should be often employed in viewing distant objects, and, if possible, verdant scenery. When the sensibility of the eye is not too great, cold lotions, or the use of the eye-bath with cold spring water, are very serviceable.

SECTION VIII.—*Prevention of those Complaints of the Eyes, which owe their Origin to the various Occupations of Life.*

As it would lead us too far to enter into a detailed examination of all the sources from whence injury might arise to the eyes, connected with the various occupations of life, we shall take as comprehensive a view of the subject as possible, and

confine our observations to some of the points principally deserving of attention.

In addition to the general precepts given in different parts of this work, literary men and artists will do well to attend especially to the following. When the mind is occupied with intense thought, the sight ought never to be exerted for a long continuance of time without intermission. The occupation, as well as the position of the body, should be frequently varied, and carried on by the individual, sometimes standing, and sometimes seated. Books with large print should be chosen, paper of a brilliant dazzling white colour should not be used for writing, and the object with which the person is occupied should be at as great a distance as possible from the eye. The eyes should not be exerted with reading or writing immediately after lecturing to a large assembly; neither immediately after meals; nor while the body is heated. Exercise out of doors, field sports, &c.; strict attention to the stomach and bowels, proper regulation of light, and especially of artificial light; judicious management of the sight; and a prudent choice and use of eye-glasses, cannot be too urgently recommended. Microscopic examinations should never be long persevered in; each eye should be used alternately for this purpose, and should be frequently washed with cool spring water; weak eyes should refrain altogether from such researches. These remarks are

applicable also to naval officers and astronomers, who should moreover, in viewing the heavenly bodies, especially the sun, make use of dark neutral-tinted eye-glasses. Engravers, watchmakers, &c., ought to learn by early practice to use the lens equally well with either eye. Chemists, when they have occasion to look upon a bright flame, should likewise wear glasses of neutral tint; and when their eyes are exposed to acrid fumes or vapours, especially such as rise from the mineral acids, they should wear colourless glasses either of a spherical form, or provided with side-pieces.

Miners, labourers on the high roads, and all persons employed in breaking ores, or stones, are exposed to the danger, that small fragments of stone may fly with violence into their eyes; to prevent this, a kind of spectacles with large fronts of wire net-work of a spherical form, and entirely surrounding each eye, is very appropriate. Ship-builders, masons, bricklayers, and all persons who work in the open air, and who are besides occupied with bright and shining objects, should wear straw hats with broad brims, green on the under surface, and over-shadowing the face, to defend the head and eyes from the effect of the dazzling light and heat of the sun. Millers, bakers, and workmen employed in silk, cotton, woollen, or linen manufactories, may escape the inflammation of the eyes which not unfrequently arises from the particles of dust, that are floating about, by often cleansing the eyes

either with tepid, or cool spring water. The dust from sheep's wool in particular 'is apt to produce a complaint of the eyes, which often proves very tedious. Soap-boilers, and workmen in colour, sulphur, and all those manufactories in which during the occupation acrid, corrosive vapours are evolved, may keep off the inflammation, running of the eyes, cataract, and amaurosis produced by those vapours, if they wash their eyes frequently with tepid water, and wear during their hours of labour plain colourless spectacles of spherical form. Locksmiths, blacksmiths, workmen in glass-houses, iron-foundries, or smelting-houses, the stokers employed at the fires of steam-engines, gas-works, &c., as also bakers, when they stand before the oven, and tavern-cooks; and all persons who have to look constantly upon a bright flame, and to expose the eyes to a high degree of heat, may best defend themselves against the cataract and amaurosis, to which they are liable, by wearing dark neutral-tinted spectacles. Persons occupied constantly with coal-fires, or in iron-foundries, must have these spectacles either of a spherical form, or provided with side-pieces, in order to defend themselves against the running of the eyes occasioned by the sulphurous vapours that are emitted; but the principal rule to be observed by all these classes of workmen is to wash the eyes frequently with tepid, or when not heated, with cool spring water, in order to refresh and strengthen them.

All persons who are employed with objects that strongly reflect the light, as goldsmiths, jewellers, burnishers, &c., should make use of neutral-tinted spectacles, to keep off *muscæ volitantes*, weakness of sight, and amaurosis. Lastly, those persons whose eyes are much exerted upon fine work, as draughtsmen, writers, composers, needle-workers, &c., must take particular care to have the object placed in a proper light; to keep it at as great a distance as possible from the eyes; to look often at distant objects; to work in an upright posture, not with the abdomen compressed nor with the body bent forward; and to use much exercise in the open air, in order to prevent near-sightedness and the other complaints of the eyes just mentioned.

SECTION IX.—*Caution against Empiricism and the use of Nostrums in Diseases of the Eye.*

We have by this time, more especially in the first part of this Treatise, made ourselves acquainted with an organ, which is quite indispensable to the full enjoyment of life, to the cultivation of the mind, and to the exercise of every business or profession,—for the blind man, as far as regards the business of civil life, may be considered as dead; we have become acquainted with an organ, which of all the organs of the body is the most admirable, the most perfect, and the most delicate in its con-

struction ; which stands in the most subtle relation with the soul, and in the most intimate union with the whole organization of the body. Whoever is fully aware of all this, would, it might be imagined, be extremely cautious of doing any thing which could possibly be injurious to the organ of sight. Yet to what hazard does that individual expose the eye, when on its being affected with any disorder, he has recourse to the nostrums which are trumpeted forth as universal ophthalmic remedies, or applies for relief to incompetent persons, unacquainted probably with the first principles of medical science !—As poisons in the hand of the intelligent physician become means of cure, so may the means of healing in the hands of the empiric become poisons.

Most of the eye-waters, eye-drops, eye-ointments, nostrums against cataract, or amaurosis, &c. contain a greater or less proportion of ingredients, possessed of powerful medicinal properties, the effect of which upon the eye must be the more dangerous whenever they are employed in cases to which they are not adapted, or in an improper manner. By the very name of nostrum or arcanum, it is implied that the knowledge of their ingredients is withheld. But even supposing the empiric to be perfectly acquainted with the composition of the medicine, is he on that account qualified to judge of its effect ; to discover the true cause of the disease for the cure of which he employs it ; to dis-

tinguish the case of the disease itself with the complications which may happen to be present; and to determine the propriety or impropriety of applying such a remedy in the existing case? Some of our readers perhaps may say—that they find printed directions given with remedies of this kind, and therefore have no apprehension in following them;—but what is the result? Where these remedies, among many cases in which they have been tried, have by chance met with one for which they were adapted, they may perhaps have not been entirely unattended with benefit, and where a strong constitution has counteracted their dangerous influence, they may have been used without doing any manifest injury; yet that experience, which the medical practitioner alone has the opportunity of acquiring, teaches us that remedies of this kind are in general either directly, or indirectly, productive of injury. No intelligent person therefore will trust the tender organ of sight thus rashly to chance, or presumptuously rely upon the assistance of Nature, in using such remedies at random, and exposing to imminent danger, if not to certain destruction, the noblest of the senses, which, when once lost, can never be recovered. How many are there who, suffering under such privation, lament, but unhappily too late, that they have ever employed remedies of this nature!

It is moreover extremely dangerous, on account

of the great tenderness and sensibility of the organ of sight, when a disorder, apparently trivial, occurs in the eye, to follow the counsel of such persons as are frequently met with in the world, who, though absolutely incompetent to give medical advice, extol some remedy or other which they may have once heard spoken of,—often, no doubt with the purest intentions, but not unfrequently merely for the sake of appearing to possess a knowledge of medicine, or of giving themselves an air of importance. Not less dangerous is it, in a more serious disease of the eyes, to apply for advice to a mere operator for cataract, who, though he may deserve credit for the manual dexterity which he has acquired in operating, is perhaps but little acquainted with the physiology and pathology of the eye, and the connexion of this organ with the whole system, and does not possess a thorough knowledge of the science of medicine and surgery; and who, after having looked perhaps with a hasty and superficial glance at the affected eye, without closely investigating the nature, character, and complications of the disease, is immediately ready to apply a remedy, or even to perform an operation. Many of the diseases of the eye are of such a nature, that it is only by the most careful investigation of the general state of health, and by inquiry into the occupations and mode of life, that even the best informed and most intelligent practitioner is enabled to enter upon a judicious plan

of treatment. In order to effect a radical cure of diseases of the eye, it is of the greatest importance to keep in view the mutual relation that subsists between the eye and the whole system. Thus at one time the complaint may be cured by making the abdominal organs the more especial object of treatment; at another time, by directing particular attention to the nervous or vascular system, &c.; and not unfrequently it is necessary to insist upon an entire change in the mode of life and occupation. The practitioner, who is ignorant of these and various other relations, or who overlooks them; who is not aware that almost all the diseases to which the body in general is liable may occur in the organ of sight; or who, lastly, is not acquainted with the particular modification of these diseases as they occur in the eye—a modification resulting from its peculiar organization—will always act like a man groping in the dark. The disorder, which perhaps at first was slight, and might have been overcome by simple but proper treatment, is at length, through the employment of nostrums, through neglect, or improper treatment, so far aggravated that it resists the most suitable remedies; or it may happen, that vision is so much impaired,—if indeed the eye be not already enveloped in total darkness, that it cannot be improved but by an operation; or that the system itself is so shaken to its foundations by the attacks which have been made upon it by various and powerful medi-

cines, that it is rapidly verging towards its entire dissolution. "You may as well believe," says Lord Bacon, "that the Pope can send you to perdition, as that an advertising charlatan can, by any empirical nostrum, restore you to health."

There do not exist then any remedies universally applicable to diseases of the eye; neither is it likely that a mere empiric, or any person who is unacquainted with the science of medicine, should be able to remove these diseases safely. That practitioner alone is qualified to cure such maladies thoroughly and permanently, who possesses a perfect knowledge of Ophthalmology (that branch of the profession which makes the eye, in all its conditions and relations, an object of especial study), founded on the sciences of anatomy, physiology, pathology, and therapeutics,—in one word, on the whole field of medicine and surgery; and who combines dexterity and skill in operation with talent and experience in the practice of medicine.

THE END.

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